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JUNE 1975 75 CENTS

Popular Mechanics

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- **Make your yard prettier, safer with light**
- **Choose and use portable sanders**
- **Pick a cordless soldering iron**

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Can balloonists beat the deadly Atlantic jinx?



R. Ginnell

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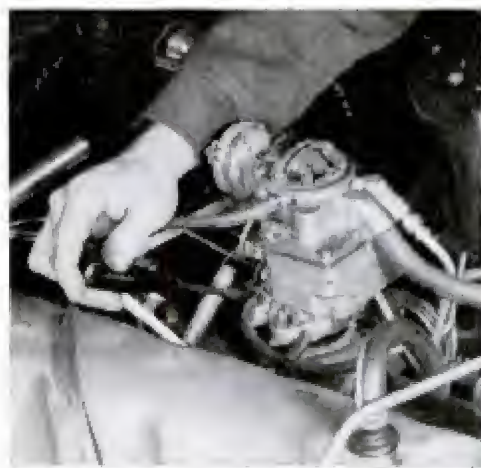


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This One



Q1GE-N5W-U436

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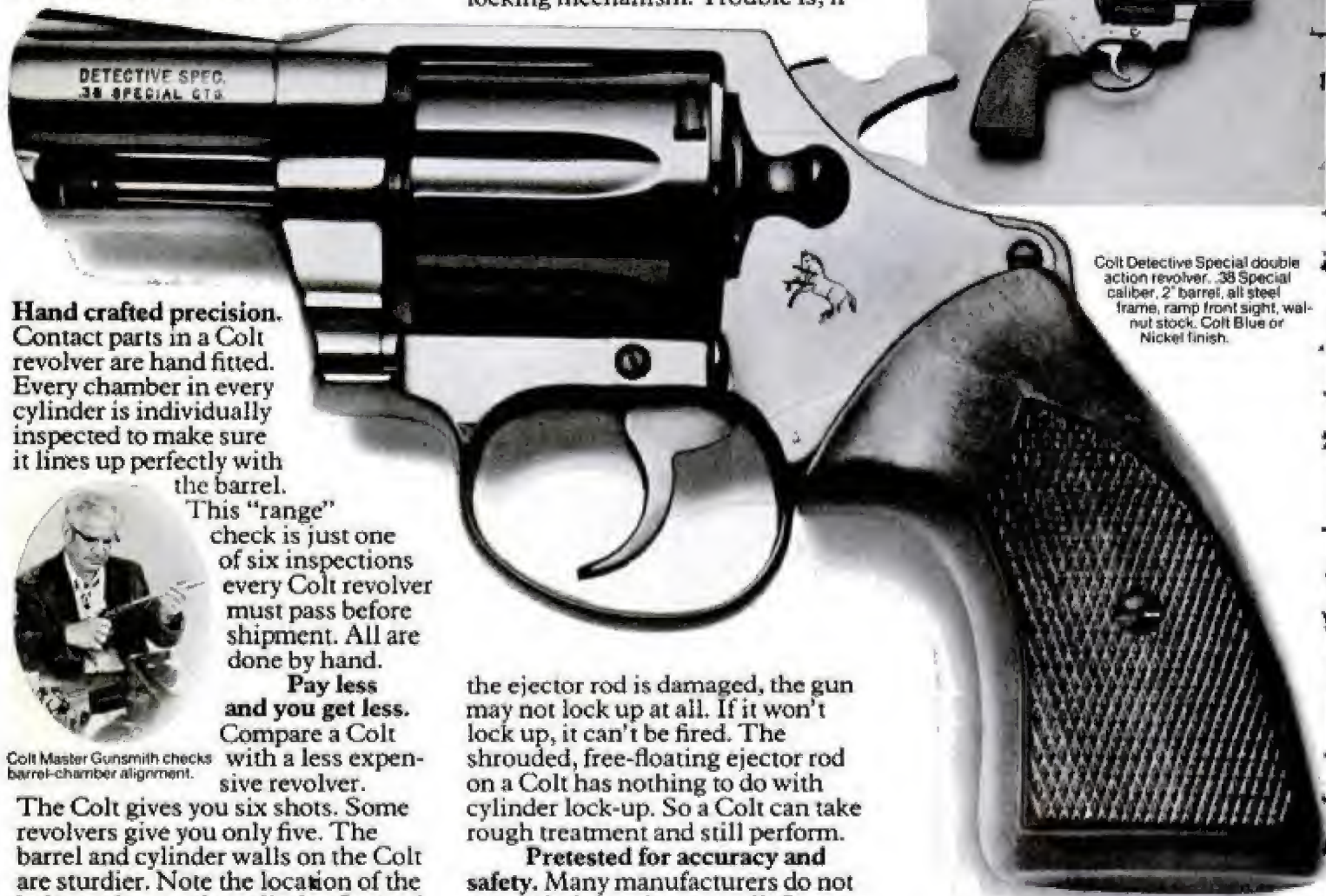
Let's face it. If you wanted to take chances, you wouldn't own a personal revolver in the first place. That's why only a Colt makes sense.

Unique lock-up. On any revolver the cylinder advancing hand moves each chamber into alignment with the barrel. On this Colt the advancing hand also functions as part of the lock-up mechanism. At the critical moment of discharge, the Colt advancing hand holds the cylinder rigidly in line with the barrel. That means less chance of shaving lead as the bullet enters the barrel. And that means a safer, more accurate gun.

Some revolvers use the barrel end of the ejector rod as part of their locking mechanism. Trouble is, if

As a safety check, every Colt Detective Special is proof fired with special high pressure ammunition before it leaves the plant. That's why Colt can recommend any major brand of ammo. For additional facts on the safety and use of handguns, send for Colt's free booklet, "Handling the Handgun." Write Colt Firearms, Dept. 31M, Hartford, Conn. 06102. There is no obligation, of course.

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the ejector rod is damaged, the gun may not lock up at all. If it won't lock up, it can't be fired. The shrouded, free-floating ejector rod on a Colt has nothing to do with cylinder lock-up. So a Colt can take rough treatment and still perform.

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Colt Detective Special double action revolver, .38 Special caliber, 2" barrel, all steel frame, ramp front sight, walnut stock. Colt Blue or Nickel finish.

You can count on a Colt. If you buy a revolver that isn't a Colt, you'll probably pay less money. You'll definitely get less gun. Only a Colt gives you the reliability your personal handgun has to have. Even if you never use it.

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AUTOMOBILES AND BIKES

- 11 Imports and Motorsports
- 36 Detroit Listening Post
- 62 The miles-per-gallon game
- 66 PM Owners Reports: 1975 General Motors compacts
- 74 A new engine can save old Betsy
- 98 Saturday Mechanic: Check your cooling system . . . now!

HOME AND YARD

- 34 Carry your tools in this sawhorse
- 58 Transform your yard into a night-blooming beauty
- 80 How to create the illusion of a sunken tub
- 88 Mobile, modular: Two ways to low-cost housing
- 107 Three great ways with walls
- 108 Shoo garden pests with a new weapon: Aluminum
- 118 How to keep your chain saw cutting

SCIENCE AND ENGINEERING

- 53 Apollo-Soyuz: Manned space mission with a new accent
- 70 Transatlantic balloon jinx: Who'll be first to beat it?
- 77 Aquapolis: City in the sea

ELECTRONICS, RADIO, TV

- 20 New tape equipment
- 41 8-track goes hi-fi—at last
- 49 GFCIs: Is circuit breaker or receptacle better for you?
- 50 Latest in loudspeakers
- 64 How to solder when there's no place to plug in
- 95 Scanners: Radios that stop and listen when there's something to hear

BOATING, OUTDOORS

- 56 257 close-to-home vacationlands—ready and waiting
- 100 Boats you once dreamed about
- 124 Trailer hitches vs. the new bumpers

SHOP AND CRAFTS

- 92 Pad sander know-how
- 102 Make this colonial cupboard to display your best china

PHOTOGRAPHY

- 10 Built-in telephoto, FlipFlash for new pocket cameras
- 14 Photo hints
- 78 Color printing: Now it's easy to make color prints at home

AVIATION, SPACE

- 53 Apollo-Soyuz: Manned space mission with a new accent

ON THE COVER

Can balloonists beat the deadly transatlantic jinx? Bob Sparks, who tried in 1973 and does not believe in jinxes, is getting set to take off again. *Illustration, Roy Grinnell*

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JUNE 1975 • Vol. 143 No. 6

INTERNATIONAL EDITIONS: Australia, Caribbean, Mexico, Southern Hemisphere

SPECIAL FEATURES:

Mobile, modular: Two ways to low-cost housing. At today's prices, homes prebuilt on factory production lines may be your best buy. Page 88.

Transform your yard into a night-blooming beauty. Inexpensive ways you can create lighting effects for greater safety and enjoyment. Page 58.

Graceful colonial china cabinet you can build for \$70. This Early American design offers the perfect setting for displaying your best china. Page 102.

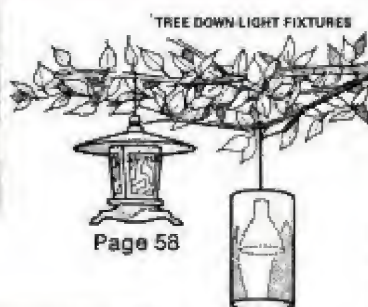
Scanners: Radios that automatically zip across "Public Safety" shortwave bands, then stop and listen to channels you want that are busy. Page 95.

Apollo-Soyuz: Manned space mission with a new accent. How American and Soviet spacecraft will dock in an orbit 140 miles above the Earth. Page 53.

Now it's easy to make your own color prints at home. You can take as little as 6 to 10 minutes to process your prints in full room light. Page 78.



Page 74



Page 58



Page 100



Page 95

EVERY MONTH

- | | |
|-----------------------|---------------------|
| 8 Letters | 30 All Outdoors |
| 12 The Bicycle Shop | 38 Car Clinic |
| 16 Science Worldwide | 46 Appliance Clinic |
| 28 Homeowners' Clinic | 82 It's New Now! |

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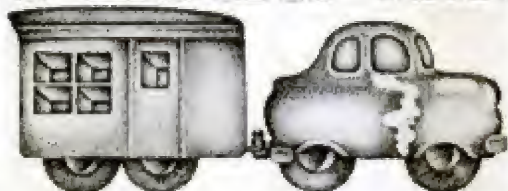


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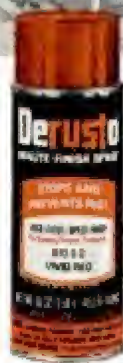
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LETTERS

FROM READERS

Propelled into action

Each year, as the time for our participation in what we fondly call "Justice Douglas' Canal Hike" approaches, our mostly deskbound group here in Washington ponders how winter's stiff bones will hold up, under even this minimal-stress initiation to our hiking season.

A friend just provided us with your April issue, with Jack Galub's *Are You in Shape for Spring?* (page 101). Articles on fitness are somewhat the going thing right now, so I thought you'd like to know that it was yours that had that something special that has propelled us from our chairs and into action.

PATTY ROYSTON
SPRINGFIELD, VA.

The article is one of the finest I have read on the subject of exercising to get into shape.

AL BURROWS
MOUNT RAINIER, MD.

New twist on teeth

List me among the hundreds (or thousands) of nitpickers who will point out an error in the April issue. There is another explanation for the difference in appearance between the two sets of teeth shown in *Science Worldwide* (page 8). The left-hand set is upside down.

D. S. DUGUID
WARREN, N.J.

It's a rare case of dental inversion, somewhat akin to putting one's foot in one's mouth. Anyway, the patient survived.

Anybody want to talk?

Is there a tape recording club in existence any more?

I should like to meet some who have cassette recorders to talk with—anywhere.

JOSEPH E. THOMAS
PHOENIX, ARIZ.

More do-it-yourself camp gear

I was interested in *Sew—You Save With Camp-Gear Kits* (page 118, March '75).

As someone who enjoys camping and saving money on camping equipment, knowing the article is well put together is very important.

Having sewn several items over the last couple of years, I want you

to know of another company dealing in kit items: Sun Down, Inc., Box 1023, Burnsville, Minn. 55337.

From experience, I find this company's articles of the highest quality and easy to assemble.

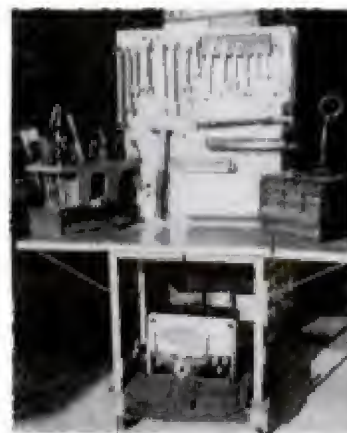
SHARYN HARVEY
SELINGROVE, PA.

Sorry we missed Sun Down; we just didn't know about the company. The firm's catalog has a dandy lineup of outdoor gear.

His own version of tune-up bench

The auto tune-up bench for your garage shown in the April '75 issue (page 105) makes sense. Do-it-yourself, if at all possible, in maintaining your own vehicle sure beats the high cost of mechanics' labor these days.

I've had my version for several years now and it is a real stepsaver. As you can see, it is simply constructed and features a converted



typewriter stand as a base for the mobile tool bench. Pushing it out in the driveway makes my tools easily accessible for most any outdoor project.

Thought you would be interested in the foregoing from an avid fan of your *Class A* magazine for just about the past half century.

KEN WORDEN
SUN CITY, ARIZ.

Really a cafe racer

Easy Riders (page 82, March '75) by Jake Grubb is good but misleading in that he does not differentiate between touring bikes and cafe racers. I'm referring to the Ducati 750 Sport which is mentioned as a touring bike, but it is in fact a cafe

racer. They are used, as Mr. Grubb mentions them to be, "riding for short fast jaunts."

Ducati makes a touring model from the same bike but it's called the 750 GT and in 1975 comes with an 860-cc engine. It is specifically a touring bike, and compared to the 750 Sport, it can be ridden for hours on end.

GREGORY MCKENNA
LENNOXVILLE, QUE.

Seeing spots

The Top 20 Lures (page 63, April '75) was very good. I noticed a black spot on Mann's Lil' George, the Bomber, the Cordell Big O and the Heddon Sonar. What is the purpose of this spot?

RODNEY DOE
WADDINGTON, N.Y.

The black spot on the lures makes them look like that panfish favorite, the bluegill. As for why showing spots makes them look tasty, you'd better ask a fish.

I, like many, many other fishermen and/or women, have been using the Bomber lure for years, and it bears no resemblance to the one identified as a Bomber on page 64.

You'll undoubtedly receive a ton of mail on this possible error.

Your new format is a vast improvement: size, readability, reproductions and depth of information.

JOHN R. SMITH, M.D.
LOUISVILLE, KY.

Bomber lures are available in 13 popular designs, offered in 29 sizes and over 163 assorted colors. The selection shown is the Bomber Pin-fish.

Will slide rules become extinct?

Are conventional slide rules in danger of extinction now that faster and much more accurate electronic calculators with slide rule functions are so prevalent?

Is there still any situation where a conventional slide rule might be preferred?

KEN GREENBERG
SKOKIE, ILL.

Yes: Where you'll be out of reach of power or batteries for a long, long time.

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(June 15)

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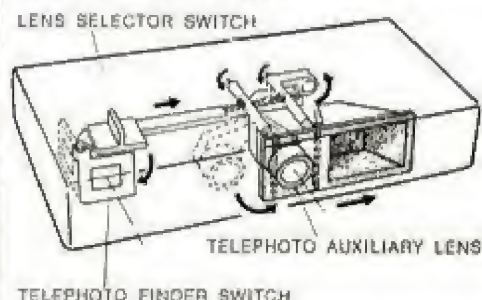
Built-in telephoto, FlipFlash for new pocket cameras



Kodak's latest Pocket Instamatics (they're called Trimlite Instamatics, now) feature a soft-touch shutter release, an all-new flash system and, on one model, a built-in telephoto auxiliary lens.

The new GE FlipFlash panels hold eight tiny bulbs that fire in sequence, with green dots behind the panel turning black to show how many you've fired. After four shots, you flip the panel upside down, to keep the live bulbs well above the lens, preventing "red-eye" reflections. An accessory extender lets you hold the flash off-camera, too, and an electronic flash is also available. FlipFlash requires no batteries—a piezoelectric element in the shutter generates electricity.

The telephoto, on the new Trimlite 608 (\$36) flips in when desired to increase the lens's focal length to 43 mm—like 85 mm on a 35-mm camera.—*Ivan Berger*





IMPORTS AND MOTORSPORTS



Ford and fun

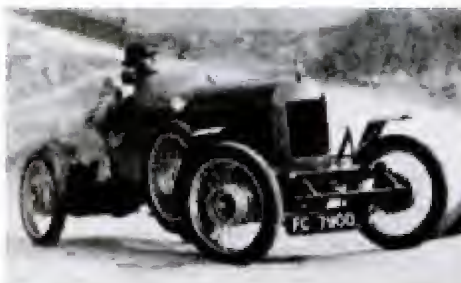
You don't hear much about boredom on the drafting board at auto companies, but just imagine if you had to spend all your working hours designing shift-lever knobs or dashboard switches. To keep sane, you'd look forward to the excitement of doing project cars like the one shown here. Designers from Ford in Dearborn and from Ford's Ghia Operations in Turin, Italy, conceived this two-seater Ghia Flashback. It was styled to evoke the classics of the past, but be a lightweight, fuel-efficient car for the future. It may never see production, but if it did it would weigh in under 2000 pounds. Wheelbase is 84 inches; overall length, 134 in.; width, 55 in., and height, 48.6 in. The Flashback was shown earlier this year in Detroit and will be at other automotive exhibitions around the country. You can't miss it!

Fox box

New to the 1975 Audi Fox model lineup is this station-wagon version. It looks very utilitarian here—and it is. But the first one I saw actually lured me away from a couple of Porsche sports cars: It was gold metallic, had a sun roof and cast alloy wheels as options. Back on the practical side is the Fox's 24 to 34-mpg economy from its ohc 1600-cc fuel-injected engine and it needs no catalytic converter. It's not cheap but it's a good value.

Golden oldie

MG No. 1 is still in topnotch running order as you can see here. It was on the road to celebrate 50 years of MG production. The year was 1925



when Cecil Kimber rolled the first car out of the Morris Garages.

Other news from British Leyland: The E-Type Jaguar will be replaced with a new sports model, the XJ-S, which will arrive in the U.S. this month. Stay tuned.

Car buff's bible

World Cars 1975 just arrived here and all work stopped. The 440 glossy pages show over 900 models from 31 countries. The four-pound, \$22.50 volume is in book stores now. Herald Books, Box 17, Pelham, N.Y. 10803.

Chic Jeep

Underneath the slick fiberglass body it's an AMC Jeep CJ5. The bolt-on body is the design work of Tom Parmley who needed new skin for his Jeep after he crumpled it up in a roll over. His replacement body improves on the original in aerody-

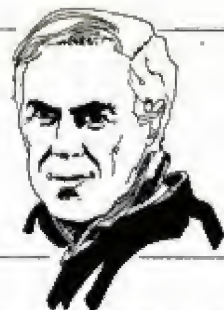


namics, roominess and other conveniences. His design also leaves room to install 10-inch-wide wheels and a bigger engine. The kit is \$1000. Parmley Engineering is at 419 East Euclid Ave., Compton, Calif. 90222. ★★★



THE BICYCLE SHOP

BY EUGENE A. SLOANE



On flat prevention

I would like to know how well "skim-mers" keep glass and other flat-producing stuff out of tires.—A. Bater, Rochester, N.Y.

People who use them swear by them. These are little wire gadgets that fit on the brake bolt and rub on the tire so any imbedded particle that would cause a flat would get pulled off before it could do so. These tire savers work only on smooth-tread tubular tires and not on any other tire, including any wired-on tire. Personally, the noise of rubbing is more annoying to me than any benefit these items offer, and I don't use them.

Drill or don't?

I'm wondering if it is a good idea to drill holes in certain parts of my bicycle to remove weight. If so, where? If not, why not?—Rob Mul-ler, Sioux Falls, Iowa.

I don't recommend drilling out any part of a bicycle for weight saving, unless you're a dedicated amateur or a money-making professional racing cyclist. Photos of bikes ridden by such world champions as Eddy Merckx of Belgium show brake levers, chainwheels, crank arms and even derailleur bodies drilled out in a frantic effort to save an ounce or two that *might* make the difference between losing and winning a crucial race. But for the average bike owner to go to all this work and expense to save a few ounces is simply time and money wasted, in my opinion. When you drill out these parts you weaken them. If interested in the cosmetics of bike appearance, you might send your cranks, seat post, stem and chainwheels to VSP, 6000 West Fitch Ave., Skokie, Ill. 60076 or write for its price list for this drilling and fluting service.

No 15-speeds?

How come I never see any 15-speed bicycles on the road? Also, we have five bikes, and I notice that their tires need air far more frequently than auto tires. Why is this?—Ken Greenberg, Skokie, Ill.

Yes, 15-speed bikes are relatively rare, especially these days when they do cost a bit more. Reason for the 15-speeds is that very wide ratio



(Granny-gear) bikes with only 10 speeds give you too much of a jump between gears. If you have a free-wheel (pictured) with 14, 17, 22, 28 and 34 teeth, combined with a chain-wheel of 49 and 54 teeth, you would have trouble finding the exact gear for comfortable cycling under the varying conditions of wind velocity, road grade and how you feel at the moment. If you convert that dual chainwheel to a triple one with a small chainwheel of 36 teeth you would have another five gear ratios to choose from, and would find cycling much more enjoyable since you would now be able to select just the gear ratio you need to cope with wind and road conditions. Also, yes, bike tires do lose air faster than car tires, because bike tires have thinner tubes more permeable to air than heavy car tire tubes or tubeless tires. You can reduce bike tire leakage by using butyl tubes.

Improving hindsight

Where can I buy a small mirror with ball joints that would fit on the down-tube, so I can eliminate having to put it on the handlebars?—Stanley Goldsmith, Webster, N.Y.

On the bars or on the tube, a mirror either place means you have to remove your eyes from the road in



front for a second or two. That's all it takes to create an accident. Far better is a little mirror (photo) you can clip on your glasses, available for around \$3.50 from Ultra-Light Touring Shop, Box 308, Brinkhaven, Ohio 43006. Specify kind of glasses

you wear (thick horn rim, wire type, flexible wire type, etc.). This mirror is much safer as you can see the entire road behind you, it does not vibrate and you don't have to look away from traffic ahead.

Best and the brightest

What is the best and lightest generator light?—Roger DeAmicis, Monte Vista, Calif.

I like the Soubitez (French) generator light set, Schwinn sells its version of this set which has a good head and taillight. If you can't find either one, ask for a generator which has eight poles and puts out six volts at three watts. Cheaper generators have six poles, put out less wattage and accordingly, less light.

The Soubitez three-piece set (generator, front light and rear light) sells for around \$10.50.

Getting back copies

I would like to buy tearsheets of Bicycle Shop articles which have appeared in previous issues of PM. How can I get these?—Mrs. G. Daisley, Trenton, N.J.

Best way to get back copies is to go to your local library and dig out the ones you need and have them photocopied. Many libraries have coin-operated copying machines for this purpose. You can also order them from the Bureau of Information, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019, for 25 cents per page, plus 25 cents for postage and handling for each order.

I also receive many letters from readers with stamped, self-addressed envelopes or coins for stamps requesting a personal reply from me. I do regret to state I cannot make personal replies. There just aren't enough hours in the day even to return the stamps or coins, let alone write individual letters. I do try to select questions from readers that have broad application to answer in this column. ★★★

If you have any questions about bicycling send them to The Bicycle Shop, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

NEXT MONTH IN PM . . .

- **Pilot's report: New warning heads off air disasters**
- **Rust: Your car's worst enemy**
- **World's biggest car crash: How it happened**
- **15 ingenious workshop ideas**
- **Attic fans: Low-cost way to cool your home**
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RICHARD PETTY

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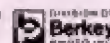
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PHOTO HINTS

FROM READERS



Cardboard stops 'shadows'

In many inexpensive enlargers, the negative is held flat by direct contact with a condenser element, which can cause Newton rings (irregular, concentric shadows). To cure this, place a thin piece of cardboard, cut out to match the negative frame, between the negative and the condenser.—Lane Sander, Yakima, Wash.



Easy racks for floodlamps

Two strips of curved-channel molding facing each other on a wall can store floodlight reflectors conveniently. I use "stucco mold" (shown in profile). Mount one molding first, then use a reflector to position the second. The reflector should fit snugly, but slide freely. The three-foot unit shown holds three of my floods. The moldings can be vertical or horizontal; if vertical, mount a piece of 1x1 at the bottom of keep the reflectors from falling out. Position brads so lower rims of top and middle reflectors can rest against the brads or be slipped past them to slide to the bottom position.

—E.V. Reyner, Salinas, Calif.



The time to have your car's air conditioning serviced is before you need it.

If you're one of those people who believe in regular car maintenance, then you probably wouldn't think of putting off an engine tune-up. But do you give your car's air con-

ditioning system the same attention? You should.

A trained AC-Delco air conditioning serviceman is someone to see. When you ask him to check out your car's air conditioning system, you are getting someone who knows air conditioning.

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SCIENCE WORLDWIDE



New medical use for laser

Laser-generated X-rays show promise as a new medical tool, especially in the early detection of breast cancer, according to scientists at the Battelle Laboratories, Columbus, Ohio. In the X-ray probe under development at Battelle, a powerful laser beam is used to produce X-rays that are emitted from the tip of a conelike device.

Shown preparing to take an X-ray photograph, Dr. Philip J. Mallozzi positions a sheet of film behind a "phantom" breast—a plastic model that is designed to simulate the X-ray absorption properties of the human breast.

The new device offers a combina-



tion of an X-ray source of small diameter, fast exposure time, and soft (not deeply penetrating) X-rays. These features permit the making of high-resolution X-ray photos. Since blurring due to bodily motion is eliminated in such photos, it is hoped they will provide distinct images of small incipient tumors.

Now: new sugar substitute

Aspartame—a substance said to be 200 times sweeter than sugar—will be used by General Foods to sweeten a number of foods, including cereals and powdered beverage mixes. Unlike saccharin, an artificial sweetener, Aspartame has some nutritive value. But so little is needed to sweeten a food that it adds virtually no calories.

Discovered by research chemists at G.D. Searle & Co., Aspartame is a combination of two amino acids among the 22 that are called the "building blocks of life." These acids are constituents of protein.



Computer simulates air pollution

A new mathematical model that describes how air pollution spreads over large cities has been developed by scientists of the International Business Machines Corp. The work of researchers Liao Jing Hsieh (seen at left in photo) and Ching Cheng Shir, the model enables a computer to simulate the complex interactions among geographical features, pollution sources and meteorological conditions that together produce the patterns of pollution occurring in a city's air.

Commands altering a city's environment are fed into a computer, and the results can be seen seconds later on the screen of a display device. Contour lines represent different levels of pollution concentration; the patterns of these lines change with varying weather conditions. The simulation is said to achieve a realism previously unattainable. It will be used in a St. Louis study by the U.S. Environmental Protection Agency.

Waste gas going to waste

Some \$50-million worth of gas generated by treatment of human waste is being lost each year, says David Long, professor of engineering at Pennsylvania State University. "Most of the country's 10,000 sewage treatment plants make no use whatever of much of the gas that is a byproduct of bacterial digestion of sewage," according to Prof. Long. "They burn it unproductively in the air."

Though the gas is not as high in heating value as pure methane,

it could be used to run engines to generate electricity or heat homes and factories. "We have the technology and it is relatively inexpensive," says Prof. Long.

Toy may be therapeutic device

Spacepod (below) is an English amusement park toy that tilts and rotates as the strapped-in pilot "flies" it by shifting his weight. The tubular steel frame is fitted with nylon bearings that cause movement to be almost completely free of friction.

Spacepod is now being studied by RAF scientists for possible use in reconditioning pilots who have developed a fear of flying.



Map from satellite for sale

A space "map" of the conterminous United States is now available. A mosaic of images made by NASA's LANDSAT-1 satellite, the map shows what the nation looks like from 570 miles in space.

Two versions are available. One was made in visible band of the spectrum (called Band 5), and it accentuates urban areas. The second, composed of infrared images (Band 7), highlights topographical features. In ordering, you should specify Band desired. The 29-by-41-inch maps—at \$1.25 each—may be ordered from the Branch of Distribution, U.S. Geological Survey, 1200 South Eads St., Arlington, Va. 22202.

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Wheel balancing	YES	NO	NO	NO
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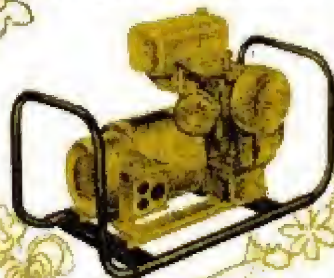
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New treats keep cropping up for tape enthusiasts. Among them:

Advent's Dolby-encoded cassette recordings combine great music (and some great performances) with crystal-clear sound. A mix of classical works from Nonesuch, Connoisseur Society and Advent's own recordings, the tapes are made on chromium dioxide tape and packed in premium cassette shells to prevent jamming.

Craig's \$150 Electronic Notebook model 2624 claims to be the world's smallest portable recorder using standard cassette tapes.

It also features a digital tape counter, and lets you backspace while

recording to correct wrong words.

Compactness of a different sort is featured by the Answerline Phone-Chek LP5 recorder, that crams 12 hours of talk onto a standard C180 three-hour cassette. At ultraslow tape speed of 15/32 inches per second, fidelity won't be high enough for music. But this is useful for taping phone calls, sales orders and so forth. \$209 to \$249.

Panasonic's CQ898 FM/Stereo radio with 8-track cartridge player is built to be at home in a dashboard—so they built their CJ-20H power supply home and digital clock to look like one.—Ivan Berger

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Gasoline or

Either way, your best choice



Most campers go with gasoline. Here's why:

Four out of five outdoorsmen prefer gasoline appliances for their light, heat and cooking power. (You just won't find many campsites without a Coleman gasoline lantern and stove.) And there's more than one good reason:

1. **LOWER COSTS:** Lanterns, stoves and heaters powered by Coleman fuel cost much less to operate than propane appliances. (In fact, cooking on a propane stove using the standard 16.4 ounce bottle costs over five times more than cooking on a gasoline stove with Coleman fuel.) The use of a big propane bulk tank and hoses bring operating costs down to compare favorably with gasoline . . . but the cost of the equipment goes up and portability goes down. So any way you look at it, using gasoline appliances cost you less.

2. **DEPENDABILITY:** Coleman gasoline stoves and lanterns bought twenty years ago are still going. Trip after trip. Because Coleman builds in dependability into every appliance. Just take the exclusive Band-A-Blu[®] burners on all Coleman stoves, for instance. They're stainless steel. Self-cleaning and spill-resistant. And you always get even-burning cooking power. No hot spots. The deep ports make the burners wind resistant and assure you of no backfires.

3. **PUMP POWER:** The Coleman gasoline stove delivers plenty of cooking power. And there are times you really need it. Like when the wind kicks up. Or the temperature drops. Or at high altitudes, where the air gets thin. That little pump on the gas tank does it. It lets you get an approximate input of 25,000 BTU's of cooking power on a single burner. That's more than twice the maximum cooking power you will get on a single burner of a propane stove.

4. **FUEL AVAILABILITY:** Coleman Fuel is readily available in better sporting goods and hardware departments and stores throughout the United States.

5. **MORE ABOUT COLEMAN FUEL:** There is no better fuel made for gasoline appliances. Period. Coleman Fuel is triple-filtered to burn clean and prevent clogging or gumming up. And a rust inhibitor is added to fight corrosion. Coleman Fuel makes any gasoline appliance perform better . . . and protects it for longer life, surer service. You're always assured of better results . . . especially if the equipment bears the Coleman name.

Propane?

is Coleman.



Or, if you prefer the convenience of propane:

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1. **CONVENIENCE:** A twist of a knob starts the propane flowing. You operate the appliances like you would a gas range. Coleman's exclusive 15 PSI regulator assures constant fuel pressure. There's no pressure build-up in the hoses. No wasted fuel.
2. **COLEMAN SAFETY:** Coleman builds in safety on all appliances, gasoline and propane. On the propane equipment, all hoses have safety shut offs ... so if the appliance is disconnected while operating ... the fuel flow stops. Automatically.
3. **RUGGED CONSTRUCTION:** Gasoline or propane, Coleman doesn't believe in cutting corners. The propane line is built

with high quality metal formed in stylish, modern design. The Band-A-Blu® stove burners are stainless steel. And the pyrex globes on the lanterns can take the heat, hard knocks and scratching brush.

4. **PROPANE FUEL SUPPLY:** Coleman propane comes in handy disposable bottles ... or a refillable bulk tank. (Hose extensions and accessories let you run up to three appliances off one bulk propane tank.)
5. **PROPANE EXPERIENCE:** Coleman has been making propane equipment for 15 years. And it shows. Coleman propane appliances are dependable, durable and safe. The best way to shop for a propane appliance ... is to look for the Coleman name.

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"I'll never forget how when they laid off

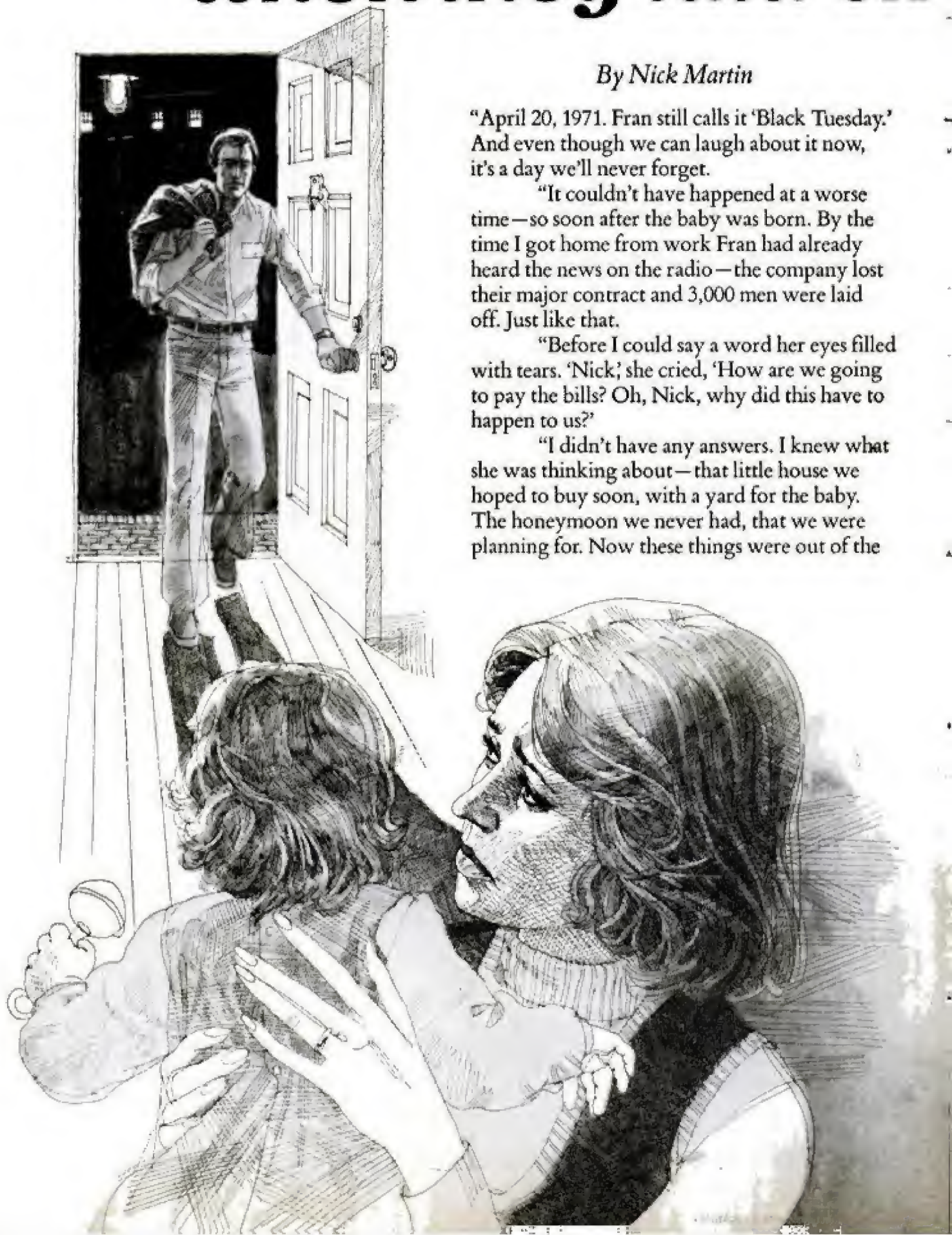
By Nick Martin

"April 20, 1971. Fran still calls it 'Black Tuesday.' And even though we can laugh about it now, it's a day we'll never forget.

"It couldn't have happened at a worse time—so soon after the baby was born. By the time I got home from work Fran had already heard the news on the radio—the company lost their major contract and 3,000 men were laid off. Just like that.

"Before I could say a word her eyes filled with tears. 'Nick,' she cried, 'How are we going to pay the bills? Oh, Nick, why did this have to happen to us?'

"I didn't have any answers. I knew what she was thinking about—that little house we hoped to buy soon, with a yard for the baby. The honeymoon we never had, that we were planning for. Now these things were out of the



scared Fran was half the plant."

(A DRAMATIZATION)

question—with no job, we'd be lucky just keeping our heads above water.

"It was a tough six months. With all the bills we had to pay there was no room for luxury. My wife went back to her waitress job part-time, I went on unemployment and stayed home with the baby, and we ate an awful lot of macaroni and cheese.

"Being broke changed us both. Our tempers were short, and we argued with each other all the time. It's true when they say that money problems can destroy a marriage quicker than anything. They almost destroyed mine.

"Somehow we survived until the plant opened again, but there were no houses or honeymoons. Right after I went back to work I vowed that I would never be so bad off again. And I decided to enroll in a program that would train me to be an electrician.

"That all happened over four years ago. But now, a lot of places are laying off again. Only this time, I'm not scared. My studies really paid off.

"I'm my own boss now, repairing electrical machinery. And even though some companies aren't buying new equipment these days, there's plenty of work for me. The people I service figure whatever I charge is cheaper than buying new machinery.

"I'm making good money, I've got something put away in the bank, and I'm proud of myself and my work. No matter what happens with the economy, my wife's never going to have to wait on tables again. And my daughter is going to grow up with a nice yard to play in, decent clothes to wear and a room of her own.

"I got burned once, but it taught me a lesson. And I found I could put what I learned to work for me. I've come a long way since that Tuesday. Thanks to ICS."

"Nick Martin" is fictional. But for over 83 years, ICS, International Correspondence Schools, has helped a lot of guys like Nick find a better, more secure way to earn a living. And we can help you, too. Especially if you're inter-

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America is the greatest country on earth. It's come through worse recessions than this, and it will again. But there are always going to be slow times and layoffs. And there are always going to be some people who are hurt by them and some who were smart enough to plan ahead.

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Remember, it's your life. You might as well make the most of it.

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QUESTIONS ANSWERED BY W. CLYDE LAMMEY

HOMEOWNERS' CLINIC



Shower floor peels

I have a shower stall in my basement, built over the floor drain. Paint on the shower floor peels and flakes away repeatedly. What can I use as a "stay-on" coating?—Roger Brent, Chicago.

If the concrete is smooth, not checked, hairline-cracked or otherwise rough and difficult to keep clean, then why paint it? I'd take off all the paint with a remover, rinse and leave the floor as is.

Of course, it's true that paint gives a more acceptable appearance, a cleaner look. If you want to keep the shower floor painted, take off the old coating with a remover and etch the floor with a prepared muriatic-acid etching solution you can get from your paint dealer. Follow instructions carefully and rinse thoroughly. When the floor is dry, apply an epoxy enamel, taking special care to put down a coating of uniform thickness. While this should not be considered permanent, it will outlast most other coatings.

Flues stain walls

My old brick house has chimney flues built into solid-brick walls. A discoloration shows outside, following the line of the flues in each end wall. Is there any way to eliminate and prevent this?—Harold Sparks, Erie, Pa.

No easy way I know of. But you can remove most of the stain by scrubbing with a strong solution of a cleaner such as trisodium phosphate, two or three heaping tablespoonfuls to a gallon of water. Wear rubber gloves and protect eyes from spatters. This scrubbing will remove only the surface stain. Eventually the discoloration will bleed through and show up again. The only way to eliminate it more or less permanently is to have the flues rebuilt. This may be necessary both inside and out, although the stain shows more on the outside, as a rule.

Checking for termites

A neighbor and myself have reason to suspect the presence of termites in our houses. How can we check for sure?—George Desmond, Indianapolis.

Termites usually indicate their

presence by tiny mud tunnels on masonry foundations, these tunnels extending from ground level or below up the walls to the wood framing. Tunnels can appear on masonry walls, inside or outside, in a crawlspace or on a basement wall. To discover them, one must make a foot-by-foot search, inside and out. There are other wood-boring insects—often mistaken for termites—that attack buildings. Powderpost beetles and carpenter ants are those most often found. They make small entry holes in exposed ends of rafters and especially in floor joists and the wood posts that support center beams in basements. Look for holes in the beams and wood dust below them, as an indication of their presence.

Corroded lamp base

I have a floor lamp with a large brass base and column. There's a small discolored area on the base that defies removal with any solvent or polish that I know of. It's dark-colored, located near the point where the base joins the column. Is there any possible way to remove this blemish?—Mrs. L. Murray, Northfield, Minn.

There's a metal polish sold under the trade name of "Simichrome" that usually is quite effective. Sometimes such a blemish will be difficult to remove entirely if the metal is pitted, but you can at least dull the contrast sufficiently to make it less visible. This polish is generally available from paint or antique dealers, or you can contact Competition Chemicals, Box 141, Iowa Falls, Iowa 50126.

You can also use a water-diluted solution of muriatic acid (wear rubber gloves and eye protection) or what is known as "jeweler's rouge," a hard wax containing a very fine abrasive; this can be applied and worked as a polish. Your local jeweler might supply you with a small cake of this wax. ★★★

Do you have a home maintenance or repair problem? Send it to Homeowners Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.45 postpaid. Send orders to PM, Dept. HF5, Box 1014, New York, N.Y. 10019.

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"tar," 1.3 mg. nicotine, av. per cigarette, FTC Report Oct. '74

ALL OUTDOORS

WITH BILL McKEOWN



Computer mating—out in the open

For families who want to vacation in a motor home or travel trailer, chopped van or pickup camper—but don't own one or don't feel like driving it cross country—a new answer has been announced by Kampgrounds of America. People who own a recreational vehicle and want to rent it part time, plus campers who are looking for one to rent, can get in touch with KOA at Box 1138, Billings, Mont. 59103. Initial expense is modest.

First, an owner sends a description of his rig, and what he wants to charge per week and per mile, plus \$10 to KOA. In return he gets a rental packet with information about RV leasing, rental agreement forms, suggestions about necessary insurance and \$10 worth of coupons that can be used for KOA campground registrations.

Someone who wants to rent a rig but lives in Biloxi, Miss., perhaps, and doesn't know of any RV rental outfits near Seattle, can also write KOA and send \$5. By return mail, he'll receive a leaflet of tips for renters, a computer print-out of rigs available, \$5 worth of coupons good at KOA campgrounds, and \$100 worth of discount coupons for tourist attractions around the country. He then can contact an RV owner in an area and with rates that are appealing to him.

For a fly-in vacation, he might be able to arrange to have a rental trailer preparked at a campground, ready to be lived in without any tow car necessary, and during a peak-season period when commercial RV rentals are hard to find.

The program may turn up discount rates for people who don't want to invest in their own RV rigs, and provide some welcome extra cash for RV owners as well.

How to get reshafted

Graphite, the new "miracle" material for golf clubs, fishing rods, archery bows, bicycle frames and other high-strength lightweight uses, is now available as a replacement for steel golf club shafts. 3M Co. has announced there are now over 60 "reshafting centers" around the country where pro and dedicated amateur

golfers can take their steel-shafted clubs. There Carbonite pure graphite shafts can be fitted to the old club heads, with a choice from six assorted flexes.

Increased driving accuracy is claimed for the graphite because of less radial torque clubhead twist. Longer drives are reported because of the clubs' lighter weights and less energy loss from flexing. And at a cost of about \$70 to \$90 per club, you hope so.

Locations of Carbonite 3M reshafting centers are available from the 3M Co., Box 33601, St. Paul, Minn. 55133.

Glove-compartment guide

A small new 48-page paperback booklet that is \$2.50, and worth it for the traveler, is called *Full-Service Auto-Truck Stops*. It lists over 500 truck stops, but big ones. These service centers are open 24 hours a day for fueling up and usually have round-the-clock food as well, plus a lot of other convenient services. Each center is listed by name, address, telephone number, brand of gas sold and a key to facilities such as sleeping accommodations, repairs, laundry, barber shop, truck wash and Insta/Com for the transmission of funds.

Until you've rolled down a lonely Interstate at 3:00 a.m. on a hunting, fishing or RV trip, passing darkened filling stations as your gas gauge drops, you don't really know how welcome can be the lights of an all-night truck stop ahead. Prices are usually reasonable, services today rival a shopping center, and with this \$2.50 postpaid directory from Reymont Associates, 29-M Reymont Avenue, Rye, N. Y. 10580, you can mark potential late stops on your road map ahead of time and leave one worry behind.

Safety solution

National Park Service Director Gary Everhardt credits a campaign to alert national park visitors to outdoor hazards with reducing accidental deaths by 14 percent last year. Visitor fatalities of 155 were down 24 from the previous year, but still indicate that beautiful scenery can

be hazardous as well for the careless or unsuspecting.

Motor vehicle deaths were 20 fewer and fatalities from falls were down by six, but drownings remained at the same level—73. A flash flood in a canyon of the Lake Mead National Recreation Area on the Arizona-Nevada border accounted for nine of these.

"We don't want to scare the public away from parks," Everhardt notes, "but it is important to realize that there are hazards in nature that may catch the average person, or at least the average urban dweller, off guard if he is not careful."

Boating briefs

For northern boatmen just starting their season afloat, the Coast Guard is offering a number of timely reminders:

Too many boats, according to Coast Guard inspection records, have handrails and lifeline stanchions that are deck-mounted with wood screws or self-tapping screws. A boat makes a quick turn; a passenger reaches for a grab rail, and it pulls loose in his hand as he falls overboard. Too often, it turns out, the handrails have only been installed for decoration. Even leaning on some lifelines will tear them loose. Best installation, of course, is with through-bolts and, if necessary, backing blocks under the deck.

Personal flotation devices, (as the Coast Guard calls life jackets, life vests and other kinds of life preservers), must be bought in the proper size—and not necessarily "the bigger the better." If the vest slides off when you jump in the water or if it twists and fails to keep your head above water, it's not going to do you much good. This is also true if you rearrange the straps or don't learn to secure them properly. While some preservers have lacing and adjustments to improve the fit, it is most inconvenient to work on them while you're floundering in the water. Starting out with the proper size of flotation device and fit, according to the Coast Guard, is a better procedure.

And until recently, the Coast Guard has allowed kayak and white-

(Please turn to page 32)

Something special for the man who'd rather drive a truck than a car.

The Dodge Custom Special.

The man who'd rather drive a truck than a car doesn't give his truck the weekend off.

So we're giving him a truck that looks great no matter where he goes.

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It's one more reason why the man who'd rather drive a truck than a car would rather drive a Dodge.



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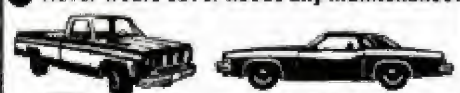
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ALL OUTDOORS

(Continued from page 30)

water canoeists to wear nonapproved life preservers. As of Oct. 1 of this year, however, they expect to change the regulation since recently a number of lightweight vests which don't restrict paddling action have received Coast Guard approval. A number of canoeing outfitters already carry the approved white-water PFDs.

Powercraft boatmen are reminded that, as of last July, all boats of 26 feet and over must mount in the engine compartment or near the bilge pump a plaque or sticker that says "DISCHARGE OF OIL PROHIBITED." The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters and contiguous zone of the United States if such discharge causes a film or sheen upon, or discoloration of, the surface of the water, or causes a sludge or emulsion beneath the surface of the water. Violators are subject to a penalty of \$5000. You can type or print your own sign, of course, or get one with adhesive backing, ready for mounting, from Goldbergs' Marine, 202 Market St., Philadelphia, Pa., or many other mail-order sources.

Boats fitted with terneplate fuel tanks (constructed of steel coated with a lead-tin alloy) are subject to fire and explosion hazards, the Coast Guard has found, as the tank corrodes and develops possible leaks. Inspection and testing of terneplate tanks are recommended, plus replacement with a different material when advisable. Fuel hoses, lines, fittings and tank supports should also be checked.

Outboards that use stick steering systems have been found, according to accident statistics, to be notably dangerous when used with a high-horsepower motor. Installation is sometimes careless and makeshift which can lead to steering failures. But the main danger is the possibility of oversteering. A small movement of the stick is sufficient to throw the boat into a turn sharp enough to toss driver or passengers overboard. Stick steering should be limited to low-horsepower motors; 33 hp is the limit allowed in Bass Anglers Sportsman Society (B.A.S.S.) tournaments when stick steering is used. Even then, stick movements should be gentle and small. A low-power outboard can capsize a fishing boat if it is steered abruptly.

Mapping the action

Every year, the U.S. Geological Sur-

vey of the Department of Interior distributes 10 million of its 40,000 different topographic quadrangle maps. Outdoorsmen particularly can find them of great use for travel by foot, trail bike and four-wheel-drive vehicle. Maps with the largest scale have the most detail and are usually the most helpful. One inch of the 1-to-24,000 scale quadrangle map equals 2000 feet on the ground and may cover about 60 square miles. Indexes to topo maps for each of the 50 states, American Samoa, Guam, Puerto Rico and the U.S. Virgin Islands are available from USGS Distribution Offices and the National Cartographic Information Center, U.S. Geological Survey National Center, Reston, Va. 22092.

Smart fishermen have found that once an area is scheduled to be dammed and flooded to make a reservoir, getting hold of old topographic maps or aerial photos can give them a head start for "structure" fishing. The old maps will show where roads, forests and buildings are located underwater, and as a result, just where fish are likely to find the shelter they prefer. A number of fishing-gear dealers and sporting goods stores in Virginia now stock just such maps, and a visiting fisherman who comes equipped with an electronic fish finder can find these charts particularly useful.

Camping clues

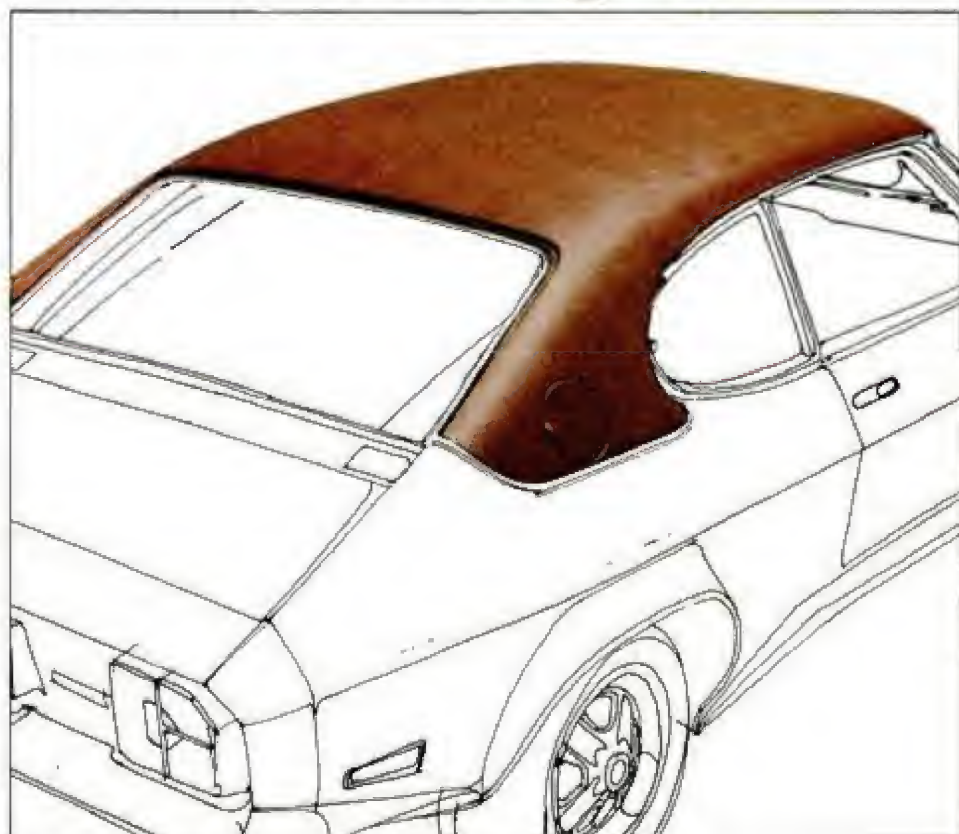
Cutting costs by camping this time of year can now be arranged through organizations and travel agents as well as on your own. Nonprofit Wilderness Society trips may still have a few openings. Its 25-cent booklet lists 115 and is available from Trip Dept., The Wilderness Society, 4260 East Evans Ave., Denver, Colo. 80222.

Mountain Travel, 1398 Solano Ave., Albany, Calif. 94706, schedules adventure expeditions everywhere from Colorado to the Sahara and Nepal.

Manitours, a division of the Manitoba Dept. of Tourism, 200 Vaughan St., Winnipeg, Man., has just announced special tours designed for naturalists and traveling interested in wilderness observation of waterfowl.

And for seeing Europe on a bargain budget, British Airways is offering a series of camping tours. Basic price of the programs ranges from \$323 to \$692 from New York, and the cost includes transportation, tolls, taxes, side excursions, plus

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"Rally" Vinyl Top Cleaner is a spray-on foam cleaner made especially to use on vinyl tops of any color before you apply a top dressing or wax. The foaming action quickly removes surface stains and dull road film that you can't get off by just washing.

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camping and cooking equipment. Designed primarily for campers under 30, their six tours last as long as nine weeks, travel by Continental Coach Tours buses, and provide a chance to camp all the way to Istanbul, Athens, Moscow or Marrakech and back with payments for the food kitty the only other major expense. While your continual comfort cannot be guaranteed at all times, the variety of camping offered can hardly be equalled.

Campers who are joiners can belong to the Association of Camping & Hiking Clubs of America at what probably rates as minimal cost. You need to send a 3x5 index card with your name and address printed on it, plus a stamped, self-addressed envelope and 25 cents. It goes to ACHCA, Box 330, Cedar Knolls, N. J. 07927, and that is your last expense. All officers and members contribute their time to band together for the benefit of the sport.

Your own fishing hole

If you have the land and the inclination but no little lake there to go fishing, you can make one of your own. An illustrated booklet called *Building a Pond—FB2256*, prepared by the Soil Conservation Service of the U.S. Department of Agriculture, gives advice on selecting a site, building an embankment or excavating, requirements for satisfactory spillways, sealing leaks and maintenance. The study is 25 cents from the Government Printing Office, Washington, D.C. 20402.

Then suppose your fish grow so well that commercial fish farming seems interesting. Sources of information about starting fish hatcheries, suitability of ponds and streams, construction and development costs, and profit margins for catfish and some other species are maintained by Catfish Farmers of America, Tower Building, Little Rock, Ark. 72201.

Outdoor education

Skills in camping, mountaineering, field biology and ecology, technical climbing and wilderness survival can now be learned from courses offered by a number of established schools. Based in Lander, Wyo. Paul Petzoldt's nonprofit National Outdoor Leadership School schedules sessions of NOLS classes from Alaska to Mexico throughout the year. Homestudy lessons have been announced by School of Outdoor Survival, Box 44, Glenwood, Wash. ★ ★ ★



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TYME savers work fast... work hard to give you "professional" results every time.

Use them to save time and money on servicing outboards, guns, lawnmowers, tools and household appliances, too. Your local auto supply store has TYME Savers now. See them all before you tackle your next job!

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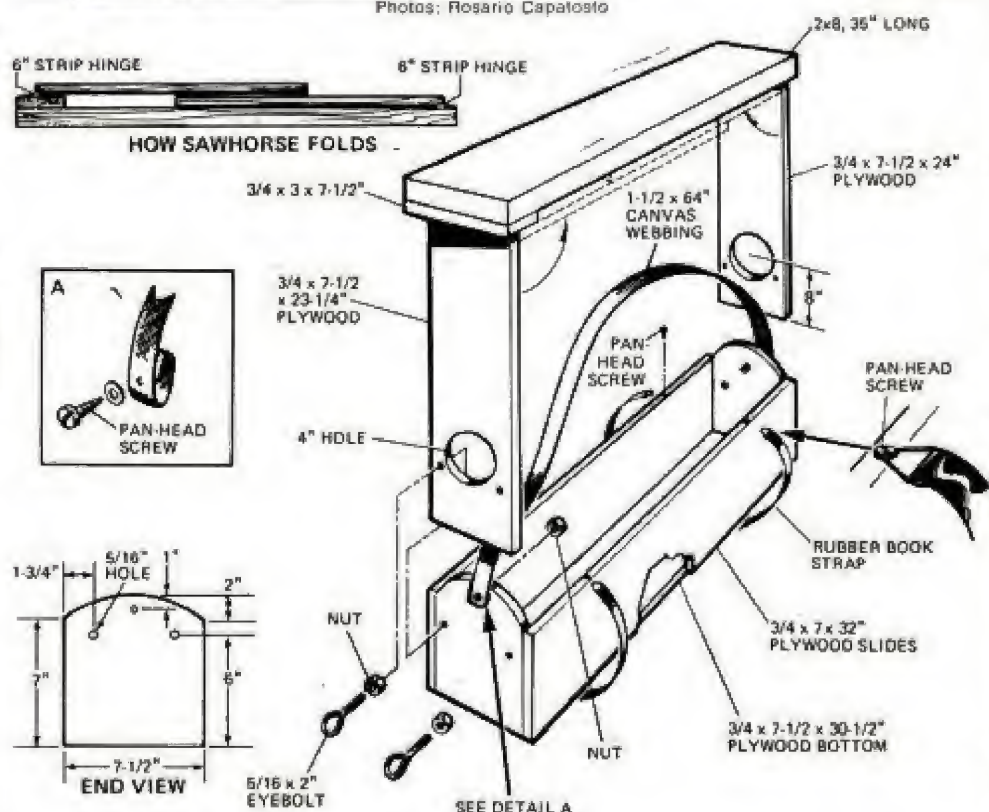
Carry your tools in this sawhorse



Photos: Rosario Capatosto



With sawhorse strapped to bottom of toolbox, you are never without a suitable bench to work on when home repair jobs take you outside. Father and son aprons, by the way, can be purchased for \$5.95 per set postpaid from Popular Mechanics, Box 1014, Dept. JD, Radio City, New York, N. Y. 10019.



With this unique toolbox you'll not have to wish you brought along a sawhorse—it totes one. Strapped to the bottom is a horse that's there when you need it. To set it up, you unhook the straps that hold it, unfold its three hinged pieces and attach it with thumbscrews to the ends of the toolbox. Its wide 2x8 top provides a dandy flat surface for saw-

ing and hammering, and the toolbox provides a sturdy, stable base. When the job's done, you pack up and sling the box over your shoulder.

Rubber book straps are used to lash the sawhorse to the box, and a length of canvas webbing is used for the sling. Holes in the sawhorse uprights clear the ends of the sling.

—Arthur Cassidy.



Datsun Li'l Hustler. First, it's built to last.

Nowadays, good long-term investments are hard to find. Datsun's Li'l Hustler is one exception. Sure, it's a gas saver. In fact, according to the EPA's 1975 test results, Li'l Hustler gets better mileage (31 mpg*) than any other pickup in America, import or domestic. But the real test of an investment is how it holds up in the long run.

Example 1: Our '75 Li'l Hustler has a new, more powerful 2000cc overhead cam engine.

Benefits: Less internal friction than in a pushrod engine, and about 43% fewer moving parts. More efficient power.

Example 2: Our cam is driven

by a twin chain, completely covered and bathed in engine oil.

Benefits: Less subject to wear and stretching than semi-exposed belt-drives. Tension adjustment is automatic, too.

Example 3: For '75 our axle ratio is an economical 4.37.

Benefits: Fewer engine revs per mile, longer engine life and great gas mileage.

Example 4: Improved ferrite stainless steel exhaust components and improved muffler construction.

Benefits: Extra corrosion protection and reduced back pressure for more efficiency, longer life.

Example 5: A nearly indestructible welded lattice frame.

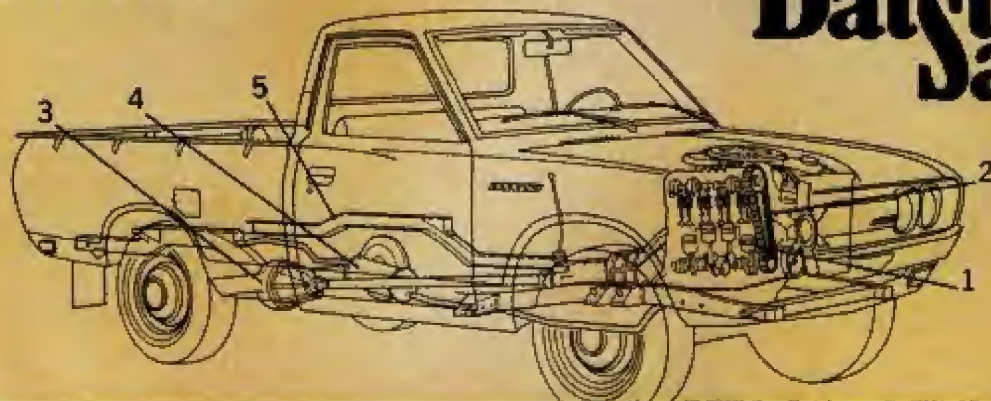
Benefits: The strength and support to endure a lifetime of rocks and ruts and grinding bumps.

Add 1400 lbs. of payload and passenger capacity, plus options like factory-approved air and 3-speed automatic transmission, and you've got one investment that just won't quit ... Datsun's Li'l Hustler. Available in two models: Standard 6-ft. load bed or the new 7-ft. Li'l Hustler Stretch.

America's #1 Selling Small Pickup

(*1975 EPA highway test results, all states except California.)

Datsun Saves



DETROIT LISTENING POST



BY ROBERT LUND

GM mini delivering 40 mpg!

GM is shooting for an August production start for its smallest-yet car, a mini Chevrolet. This would put it in showrooms around September or October. The car will have a rear seat—good for lining up grocery bags, but not very comfortable for humans because there will be only a few inches of legroom. There will be a plug-in receptacle in the car for computer diagnosis of service problems. The vehicle will have an overall length of about 175 inches on a 95-inch wheelbase.

On test cars, GM is getting 39 to 40 miles on a gallon of gas. We knew they could do it!

Ford considering son of Pinto

Ford has got wind of the GM mini and is in a tizzy to come up with something to match it. The only thing on the fire that might serve the purpose is a thinned-down Pinto—basically the current Pinto made with lighter materials to reduce weight. When GM springs with a new product, Ford usually waits about a year before putting a counterpunch car in production. But Ford doesn't want to let GM get too much of a lead with the shavetail Chevy. So Ford's strategy will probably be to put a lighter, less expensive Pinto derivative in production as soon as possible.

Incidentally, Ford says engineers and designers will no longer be equals in deciding the shape of new cars. Engineers will work out the package in terms of size, weight, materials and such key components as engine and drive train. Only then, after the engineers have assembled the contents of the package, will the stylists be allowed to decide how the package will be wrapped. This is a complete about-face from customary practice. In the past, the stylists dominated, and the engineers had to shoehorn the pieces in after the designers created the box.

Plug-in service on the way

Getting back to the GM mini, one of its most interesting features will be the on-car plug for hooking up to service equipment to track down mechanical problems. What items or systems on the car will be connected

to the plug? GM isn't saying. But as of a few months ago the company had test cars equipped with microprocessors—the much discussed “little black box”—combining controls for six items in a single unit. These included cruise control, electronic fuel injection, turn signals, antiskid brakes, electric clock and the seat-belt interlock. The latter has since been dropped.

I recently asked a GM engineer when we can expect to see microprocessors on production cars. He refused to be pinned down on a date, but pegged his answer to a price: “When we can put a microprocessor on a car for \$25 or \$30.”

Piston engine still champ

The auto companies now feel they have a good handle on what the government is going to ask of them through the rest of this decade and into the early 1980s. As a result, they are narrowing down the types of cars they will build over the next six or seven years. There isn't a single car under consideration that calls for other than a piston engine. That includes American Motors. AMC is still working on the Wankel, but its enthusiasm for the rotary isn't as high as it was a few months ago.

New breed of cars taking shape

Carmakers are beginning to be a little more open about discussing future products, and aren't adverse to dropping a few hints about what the new breed of economy/ecology cars will look like. Here's a skeleton view:

Cars will not have tucks and bulges on the sides. They will be plain and straight to reduce wind resistance and cut repair bills if you get smacked in the side. Cars will sit a little higher off the ground. Not much, but an inch or two for more headroom. Front ends will get tighter. There will be very little overhanging metal in front. Trunks may get smaller as the rear seat is pushed back for more interior room.

Parts that ‘talk’ to mechanics

If you have trouble with your car and take it in to be serviced, most mechanics follow an A B C approach to locate the problem and correct it. If A doesn't work, the mechanic

moves on to B and if that doesn't do it, he goes on to C. That's not a knock against mechanics. There's a logic to the method.

But the try and try again method is expensive, wasteful and time-consuming. Expensive because the customer must pay for each step, fix or no fix. Wasteful because parts that still have life are pulled out and replaced. Time-consuming for both mechanic and car owner.

GM is working on a fascinating concept that could do away with a lot of guesswork in auto repairs. In effect, parts that may be causing a problem “talk” to the mechanic. The part says, “I'm good. Leave me alone. Go on to step B or C.” Or the opposite: “I'm defective or worn out. Fix me or replace me.”

That sounds like Alice in Wonderland, but I've seen some of the parts. Here are two examples:

One of the first things a mechanic will do to correct a problem with an air conditioner is replace the thermal fuse. The part doesn't cost much and thousands of perfectly good fuses are pinched off and pitched out. GM has a thermal fuse with a small nipple built in. As long as the nipple doesn't show, the fuse is good. If the fuse blows, heat generated in the case causes the nipple to pop out. The absence of the nipple tells the mechanic, “Leave me alone.” If it shows, it tells him, “Replace me.”

Another example. If you get moisture in an air conditioner, the unit has to be disassembled and dried out. But the mechanic has no way of knowing if there's moisture in the system without tearing it down. So he takes the piece apart and you pay for it. GM has developed a unit that has a small window in it. A disc about the size of a dime is visible through the window. The disc is blue and pink. This means the system is all right. “Don't touch me. Go on to step C.” But if the disc turns all pink, that tells the mechanic there's moisture in the system. “Take me apart and dry me out.”

GM is working on this idea in other areas, not just the air conditioner. “Talking parts” will save car owners money, save time for mechanics and avoid wasteful replacement of parts that still have good life left in them. ★★★

After going 212 m.p.h., he's not about to smoke a boring cigarette.



Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

King Size.
Super Longs.



Viceroy has full-bodied flavor that doesn't flatten out. Always rich...always smooth...always exciting. Get a taste of Viceroy. Get a taste of excitement.

Viceroy. Where excitement is now a taste.

Kings, 16 mg. "tar," 1.1 mg. nicotine; Longs, 17 mg. "tar," 1.1 mg. nicotine, av. per cigarette, FTC Report Oct. '74



CAR CLINIC

BY MORT SCHULTZ

Sunk trunk

The taillight assembly of my 1972 Plymouth Duster does not seal properly, and the trunk floods with every heavy rain. The dealer has tried to fix the condition, and I have tried everything that I can think of. Now the trunk is starting to rust, especially in the spare-tire well where water accumulates. Please—please—help.—P. F. Louie, Hollis, N.Y.

I'm pretty sure I can. (Although it's little consolation, you aren't alone.) In any event, see if an auto-parts (or even a hardware) dealer can get you a container of Bedding and Glazing Compound (stock No. 10255) made by Kent Industries, Euclid Ave., Cleveland, Ohio. You might write the company directly.

Remove the entire taillight assembly and clean off its mounting surface thoroughly. Use a solvent, such as gum turpentine, to wash down the surface, just to make sure it's clean. Apply a ½-inch bead of the compound all around the mounting area and sock the taillight assembly back into its hole. Run the screws up real tight.

Oil slick

We owners of 1971 and 1972 Ford Pintos have to bear the cross of motor oil loss. It doesn't matter whether I drive in the city or on the highway—I have to add a quart every 400 miles. You would be doing a lot of people a favor if you could tell us if this defect can be repaired.—Steve Conley, Kent, Ohio.

Ask your dealer to consult article No. 130 of service bulletin 12 (3/3/72). If excessive oil consumption is confirmed, the dealer is to remove the valve-stem seals of the exhaust valves only and discard them. He is then to install a differently designed exhaust-valve-stem seal (part No. D1FZ-6571-C). Valve-stem seals originally installed in the exhaust valves of this engine didn't fit tight enough.

The above applies also to owners who are having the same trouble with their 1971 and 1972 Capris equipped with the 2000-cc engine.

Lost lube fitting

In the Feb. '75 Car Clinic you were asked a question by F. Geraets re-

garding a lubrication fitting on the front propeller shaft on his 1972 Chevrolet Blazer. In your answer you stated that this grease fitting was located inside the yoke of the prop shaft and was difficult to find. Since I own a 1972 Blazer and am very particular about its maintenance, and since I had never heard of a grease fitting in this particular place, I started looking for it—and looking—and looking. I spent a considerable amount of time at the service station and the dealer's where I bought the vehicle trying to find this fitting. I think you owe me and a lot of other Blazer owners, who are probably looking high and low for that fitting, an explanation.—Comer A. Robertson, Visalia, Calif.

There is a fitting in the 1972 Blazer front shaft, but you need a real sharp eye to pick it up, as you can see in the photo below. Also shown is the needle-nose fitting you need to lubricate the joint. This should be done every 6000 miles.



Mystery leak

My problem is with the cooling system of my 1974 Pontiac LeMans station wagon, equipped with a 350-cu.-in. engine. The coolant level refuses to maintain itself at the FULL mark of the overflow reservoir (plastic bottle). Where it goes, nobody including my Pontiac dealer knows. There are no visible signs of leaking. The bottle just empties itself down to the ADD mark. Give a guess, huh?—F. C. Rohman, Cumberland, Md.

Here are a few:

1. Tell your dealer to get a copy of AC bulletin No. 322 (11/73), which applies to 1973 and early model 1974 vehicles. The bulletin points out that if a hood on some models is slammed down it will compress the upper engine-to-radiator hose, causing the hose to flatten. This creates a suction effect, which can cause coolant to be

lost from around a radiator pressure cap, which may not be sealing completely, or through the overflow leading off the reservoir. The bulletin explains how to reshape the hose to prevent the problem.

2. Maybe the transmission oil cooler has sprung a slight leak and coolant is being lost in dribs and drabs into the oil cooler. Pull the transmission dipstick. If the fluid is any color but red—that's to say, if it's pink or whitish, you have found the trouble.

3. Maybe one of the engine freeze plugs has developed a slight leak. This may not be visible; it occurs only when the engine is under load.

4. Finally, it is always possible there is a slight intake-manifold or head-gasket rupture, causing loss of coolant into the engine.

Exhaust reroute

I am the owner of a 1974 Chevrolet Nova with six-cylinder engine, and have had an unbelievable problem with the exhaust pipe contacting the transmission linkage. Is there any repair?—Herb Rose, New York,

Yes, indeed. You have to route the exhaust pipe around the transmission linkage, which means that the pipe has to be bent 1½ to 2 inches. To do this, you need either a pipe bender or lots of heat (or both). The pipe has to be removed and the bow put into it.

One caution, though. You could destroy the seal between the exhaust pipe and exhaust manifold flange, so to be safe I would have a new gasket installed at this point and make awfully sure that the connection is good and tight.

Shifting simplified

My 1973 Buick Century, with column stick shift, is giving me fits. Shifting is too hard, even for a strong guy like me. The dealer can't fix it, he says. Would I be better off modifying the car and shifting the shift to the floor? Stephen Pinchot Jr., Youngstown, Ohio.

There's no guarantee that would solve the problem and it would mean much reworking of the floor pan. Why not check the following?

1. Remove side cover on the trans-

(Please turn to page 40)

Photographed at Smiths Cove, Nova Scotia



Canada at its best.

Try the light, smooth whisky that's becoming America's favorite Canadian.
Imported Canadian Mist®

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CAR CLINIC

(Continued from page 38)

mission and replace shifter springs.

2. See if the shift column lever is binding in the shift tube and if shift levers have excessive play or are not adjusted properly.

3. See that clutch releases properly. If it doesn't when pedal is pressed to floor, the shift lever won't move freely in and out of first gear. This could mean improper linkage adjustment or pedal travel, loose linkage or faulty pilot bearing.

Radials and chains

I have equipped my 1968 Oldsmobile 98 with steel-belted radials. Here in the snowy Blue Ridge-Allegheny region, I have found tire chains more effective than snow tires. Is there any hazard in placing tire chains on

steel-belted radials?—Gilmore L. Agnor, Lynchburg, Va.

Heck, no! But make sure, as with any other kind of tire, that the chains fit properly.

SERVICE TIPS

■ The Delcoiron indicator light on the dash of a 1975 Buick Regal may glow when the car is started and continue to glow with the engine idling. This is a normal condition! But the light should go out as you accelerate from idle.

■ Some car owners have voiced concern over how the 55-mph speed limit is affecting sparkplug efficiency. Specifically, they're worried that plugs will have a greater tendency to carbon-foul. Such is not the case. The ideal operating temperature range of sparkplugs is 1000° to 1200°F., give or take 100°. Tests conducted by the Champion Spark Plug Co. reveal that at 50 mph, sparkplug temperature is 900°F. and at 55 mph it is

1000°F. "Such a range is well above the normal cold-fouling range and is high enough to burn off low-speed deposits," Champion engineers state.

■ High Energy Ignition systems in 1975 Chevrolets don't have parts that are interchangeable with HEI parts of other GM cars. Certain model Buicks, Oldsmobiles and Pontiacs employ distributor pickups and high-tension coils having opposite polarity. If you use one of these, your Chevy will be hard to start and it will backfire during engine cranking. The wisest course of action when it comes to any GM car, then, is to use only the parts made for your particular model. ★★

GOT A PROBLEM WITH YOUR CAR?

Just ask Mort about it. Send your question to the Car Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems that are of general interest will be published in the column.

Some more good things you should know about Honda

Meet the Honda Power Products. They all give you famous Honda four-stroke dependability and ruggedness. And they eliminate the mess of mixing oil and gas.

Honda F-28 Tiller. Churns up a whole garden plot in minutes. Tines cut a swath from 13 to 37 inches. Fully adjustable handles also fold for easy carrying or storage. During winter, use the optional snowblower to clear your way.

Honda Portable Generators. Take electric power wherever you go. Honda generators shown here provide 400 to 2,500 watts AC output; 12 to 24 volts DC output. Dependable power for lighting, operating tools, or charging batteries. Use one on your boat, camper or job site.

Honda B-75 K1 Outboard Motor. Easy-starting.

Quiet. Water-cooled. Twin-cylinder with 7.5 hp. Terrific troller. Comes in two shaft lengths to fit your needs.

Honda General Purpose Engines. Versatile 4.5 hp engines provide power for running pumps, compressors, lawn mowers, belt conveyors, generators... you name it. Precision-built. Available with either 1,800 or 3,600 rpm shaft speed.

See Honda Power Products at most Honda dealers. Look in your Yellow Pages...or call us collect at (213) 389-1291 for the name of your nearby dealer.

HONDA
Power Products



For optimum performance and safety, it is recommended that the owner's manual be reviewed prior to operation of unit. "K" numbers indicate model changes.



3M-Wollensak 8075 8-track tape cartridge deck has facilities for hi-fi, low-noise recording on special tape and costs \$340.

8-track goes hi-fi—at last

Eight-track cartridge tape—the most popular tape format in the country—has long been a technical stepchild. All the latest advances in tape recording, such as improved tape formulations and Dolby noise reduction, have been applied to cassette and open-reel tape for years, but not to 8-track until now.

But the 3M Wollensak 8075 we tested has Dolby noise reduction (including facilities for listening to Dolby-processed FM programs picked up by your tuner or receiver), and a special switch setting for 3M's "Classic" tape formulation. The result, according to 3M, is frequency response that's flat within ± 3 db from 30 to 15,000 Hz, and a signal-to-noise ratio as high as 60 db at the highest frequencies (where Dolby action—and the need for it—are greatest) and still as high as 53 db at the lower frequencies.

With standard tape and without Dolby, performance slopes off to a still-quietly-respectable 30-12,000-Hz response and better than 50-db signal-to-noise ratio. Listening tests

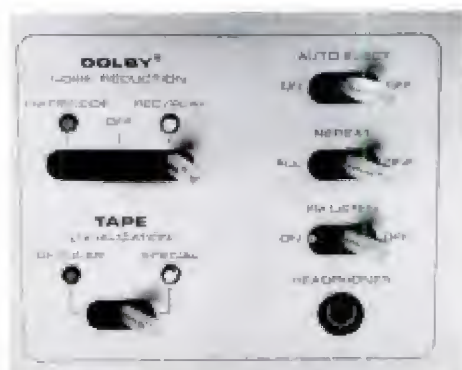


Tape counter shows actual recording time in minutes and seconds, not just numbers.

confirmed that frequency response and noise were far better with Classic tape and Dolby than without. Wow and flutter, even on slow piano music, were unobjectionable—surprisingly good for an 8-track unit.

Fidelity isn't the unit's only strong point. It has VU meters, sliding record-level controls and a pause control for more convenient recording. There's also a tape counter that reads in minutes and seconds rather than in arbitrary numbers.

As with all 8-track decks, there is no rewind facility (a major convenience in cassette decks), and the fast-forward is comparatively slow by cassette or open-reel standards—only $3\frac{1}{2}$ times normal playing speed. But the inconvenience of getting back to the beginning of a track is eased by a pair of controls that can be set to automatically stop and eject the tape as soon as its gets to the end of its track—you needn't stand around and wait the $6\frac{1}{2}$ minutes that a 90-minute cartridge takes to go around once (on fast-forward). The same controls can be adjusted to play the whole tape before ejecting or to endlessly repeat either the whole tape or a single track.—*Ivan Berger.*



Unusually complete controls include Dolby noise reduction switch, equalization selector for different tape types, versatile eject and repeat controls (see text).

SIMONIZ HEAVY DUTY AUTOMOTIVE ENGINE TRIM WHEEL TIRE VINYL UPHOLSTERY FLOOR MAT

or just
about any
thing
else on
your car



CLEANER DEGREASER

Available in 28 oz. spray gun container and 64 oz. refill wherever you buy auto parts and accessories.

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You can tear out all the cards in this magazine...

But this is the one you should mail!

**If you're thinking of investing your money
in a learn-at-home program in electronics, there are
a few things you should know first.**

Selecting a home electronics program isn't easy. It could be one of the most important decisions you'll ever make for your future. So you want to decide carefully and get the best education you can.

After all, you're investing your time and money, and you want a full return on that investment.

**What should you look
for before you select a school?**

You probably want a school with a proven track record of quality and performance. You want personal attention plus, the convenience of learning at home. You want the most up-to-date technical texts... teaching aids and learning methods.

But most of all you want to actually learn what electronics is all about. Not just theory, but actual hands-on experience with the latest and best technical equipment available today!

**At Bell & Howell Schools, you get
all that...and so much more!**

Bell & Howell Schools has been in the home-study electronics business a long time. Almost half a century. In that time, we have developed teaching techniques that provide our students with the most vital and comprehensive learning system available for at-home study.

**Techniques like our "step-by-step"
concept of learning.**

At Bell & Howell Schools, we start you off with the basics. Then take you step by step through the learning process. You work at a comfortable pace—not too fast...not too slow. If you already have some learning or experience, we'll arrange advanced standing in the program so you can skip the beginning lessons. And don't worry if you don't have any electronics background. 25% of our graduates never

even had any electronics training before enrolling with Bell & Howell Schools. (Based on a recent survey of our graduates conducted by an independent research firm. Survey results available on request.)

Or our system of personal contact.

No course is without its problems. And when you get hung up on a problem, you want answers and you want them fast. Here at Bell & Howell Schools, we combine the convenience and pleasure of learning at home with a system of personal contact with faculty and other students that rivals—if not beats—any other program available.

For problems that "just can't wait" we have a toll-free "hot-line" that you can call and discuss your questions with an experienced instructor. You get real attention—someone whose only job is to see to it that your individual questions are answered. And answered quickly and clearly!

To help you develop your thoughts and understand electronics principles more thoroughly, Bell & Howell Schools has developed a unique feature that no other learn-at-home program has—In-Person Help Sessions in 50 major cities throughout the United States. These let you get together with instructors and other fellow students. There you can talk shop with other people who share your interests... explore your problems further... and get additional assistance.

But that's not all that Bell & Howell Schools will do for you! In addition to our vast experience and expertise, is a philosophy that the best learning comes from working with the best equipment available! And that's exactly what our students do!

What better way to learn electronics than to actually work with electronics equipment?

And what better way to find out how things fit together... how they work and why they work than to actually build the equipment? And we don't mean gadgets that will be worthless to you later.

We mean equipment like the Bell & Howell Schools exclusive "Electro-Lab" electronic training system including design console, digital multimeter and oscilloscope, that you can use professionally after you've graduated.

The design console will allow you to set up and examine circuits without having to solder them in place.

The digital multimeter measures voltage, current and resistance and displays its findings in big clear numbers for easier reading.

And the solid-state "triggered sweep" oscilloscope is similar in principle to the kind used in hospital operating rooms to monitor heartbeats. But you'll use it to monitor and analyze tiny integrated circuits. And you'll find the "triggered sweep" feature locks in signals for easier observation.

That's not all you build when you choose a course from Bell & Howell Schools!

To learn the most advanced electronics technology, you have to work with the most advanced training tools.

So in addition to the exclusive "Electro Lab" system that you will build as part of Bell & Howell's Home Entertainment Electronics program, you'll also build a 25" diagonal color TV with digital features.

Sounds exciting, doesn't it? Well, digital electronics is exciting! Its growth and application are giving us new and better products and a whole new realm of split-second accuracy that was just a dream a few years ago. And this new technology is being applied more and more to TV's, clocks, radios and other home entertainment equipment.

By studying with Bell & Howell Schools—one of the first schools to introduce digital electronics as part of its training program—you can actually get in on the ground floor of this new technology while learning all the basic electronics principles and skills you'll need to detect and troubleshoot problems professionally on digital and other electronic equipment.

Make no mistake about it! As you build your digital color TV, you'll get a thorough grounding in electronics principles. You'll develop a working knowledge of "state of the art" integrated circuitry and the 100% solid-state chassis. Plus you'll actually know how to program a special automatic channel selector to skip over "dead" channels and how to build a remarkable on-the-screen digital clock that flashes the time in hours, minutes and seconds.

But most importantly, you'll have the skills that could lead you to a brighter future...

And isn't that what education is supposed to be all about? At Bell & Howell Schools we've always thought so. Get full details about us, our courses, our philosophy of education by mailing the postage-paid card today. If you take one of our courses for vocational purposes, this program is approved by the state approval agency for Veterans' Benefits.

Mail card today for full details!

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APPLIANCE CLINIC

BY PAUL MANN



Getting grounded

I own an old circular saw not fitted with a ground wire. Is the tool dangerous to use? If it is, is there a way of attaching a ground wire?—Peter Longlas, Ridgefield Park, N.J.

Yes, the tool is dangerous to use. Yes, you can attach a ground wire.

Go to a power-tool dealer and purchase a three-wire line cord. The green wire is the ground wire. Solder a terminal clip to it. Now open the tool where the switch is (usually in the handle). Disconnect the old line cord and discard it. Attach the live wires of the new cord to the switch in their proper positions. Attach the ground wire to the saw's metal housing (or a metal part if the housing is plastic). An ideal place would be beneath a screw that holds the switch in place. Loosen screw, slip terminal clip under it and fasten it firmly. You now have a grounded line cord.

If you have only a two-slotted wall outlet to use the saw with, you can use a three-prong-to-two plug adapter—but you'll be defeating the purpose of installing a grounded line cord if you're not careful to ground the adapter by fastening its pigtail down under the outlet's cover plate screw. Make sure this screw is metal and that the threaded hole it goes into under the cover is also metal and grounded to the outlet box. If not, you still have a dangerous tool.

Trouble cooking

A noncompany serviceman told us we probably need a new thermostat for our Roper gas range, only 15 months old. The flame doesn't stay on enough to get the oven hot. It lights, but cooking takes a year and a day. Is the serviceman right?—S. L. Headlee, Van Meter, Iowa.

He might be, but I wouldn't re-

place that thermostat just yet. There are two more likely possible causes: 1. A defective FM control. This has a capillary tube filled with mercury to maintain oven temperature at the setting chosen. When the temperature exceeds this setting, the FM-capillary cuts off the heat; When it falls, the system lets it rise again. 2. A partially clogged pilot. The pilot effects the operation of the FM control. If it is partially blocked, heat needed for the control to operate the gas valve is never provided. The oven then operates at half speed, so to speak.

If there is no Roper service facility nearby, ask your local gas company to send or recommend a serviceman.

Better way

About one foot of the rubber gasket around my Frigidaire refrigerator

(Please turn to page 48)

"Grit-Edge" blades trim tile with style.



Remington "Grit-Edge" rod saw and hacksaw blades make contour cuts in ceramic tile, snag-free cuts in high-pressure hose, cuts at any angle in hardened steel, space-age alloys and plenty of the other "unsawables".


Hundreds of tungsten carbide particles permanently bonded to "Grit-Edge" blades make them a match for materials conventional blades can't tackle.

Economical, durable "Grit-Edge" blades take the tough out of tough jobs.

For more information, see your hardware dealer or write: Abrasive Products, Dept. 945, Remington Arms Company, Inc., Bridgeport, Conn. 06602.



When ordinary blades can't cut it.

Remington 

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"Grit-Edge" blades can cut it.

Material	Rod Saw	Hack Saw	Saber Saw	Circ. Saw	Band Saw
Asbestos-Cement	X	X	X	X	X
Beryllium	X	X			X
Carbon	X	X		X	X
Cast Iron	X	X			X
Composites	X	X	X		X
Composition Board			X	X	X
Fiberglass	X	X	X	X	X
Foamed Glass	X	X			X
Friction Materials	X	X	X	X	X
Glass	X	X			X
Hardened Steel	X	X			X
Honeycomb Materials					X
Marble, Natural	X	X	X		X
Marble, Synthetic	X	X	X	X	X
Plaster			X	X	
Plastic Laminates	X	X	X	X	X
Plywood			X	X	X
Stainless Steel	X	X	X*		X
Stranded Cable	X	X			X
Superalloys, Iron-base	X	X			X
Superalloys, Nickel-base	X	X			X
Tempered Hardboard			X	X	X
Tires, Steel-reinforced					X
Titanium	X	X			X
Tile, Ceramic	X	X	X		X

*Requires coolant and variable-speed machine



When ordinary blades can't cut it.

Remington 

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15 and 9.9 hp compacts. More of everything but size.

Nobody gives fishermen more in an outboard they can carry. Yet, our 9.9 hp and 15 hp are more compact than any comparable competitive motor. And electric starts, which include a 5 amp alternator to charge the battery, are sized the same as our manuals.

All have FireFlash ignition for quick, easy starts, long spark plug life. A programmed tilt-lock for shallow water running. Co-pilot steering for hands-off trolling. A sound-sealed powerhood,

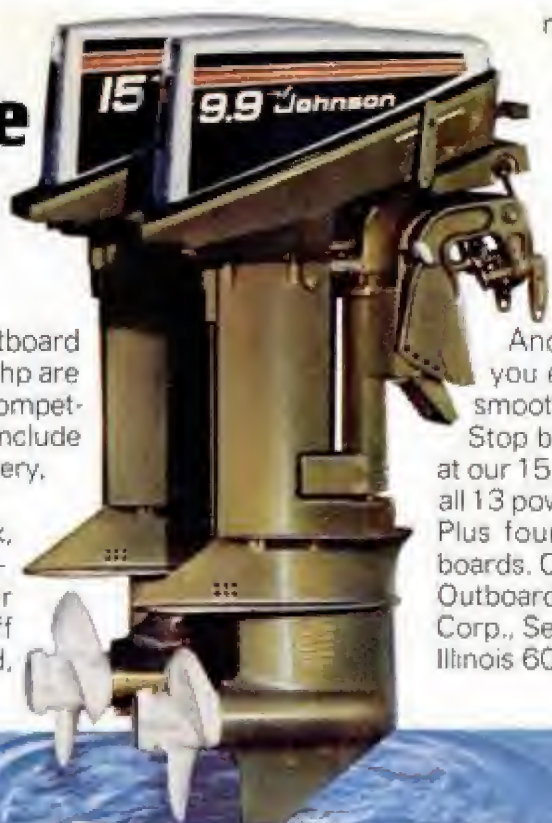
mid-section Watershield silencing and thru-propeller-hub exhaust to keep you running quiet.

And our 1975 compacts give you still more of what you need for fishing. A new longer tiller handle puts twist-grip throttle and steering closer to you.

Manual models can be started in gear at low trolling speeds.

And a new, heavier flywheel gives you easier starting, smoother idling, smoother trolling.

Stop by your Johnson dealer for a look at our 15 and 9.9 hp compacts. Look over all 13 power choices... 2 through 135 hp. Plus four new high-thrust electric outboards. Or write for free catalog. Johnson Outboards, Div. Outboard Marine Corp., Sea-Horse Dr., Waukegan, Illinois 60085, Dept. PM-65.



Performance-engineered by the world leader

Johnson
OUTBOARDS

Johnson Outboards Marine Corp. Waukegan, Illinois 60085

APPLIANCE CLINIC

(Continued from page 46)

has come loose at the bottom. The rubber is tight around the rest of the door. I'm using electrical tape to hold the loose material in place. Could you suggest a better solution?—Elmer W. Kufalk, Antioch, Ill.

Yes—a new gasket. This one may be split or starting to wear in the weak area. Your tape idea is okay but temporary. Eventually, hot air will begin to leak into the refrigerator. The gasket is probably held to the door with screws, so I would first see whether a loosened screw in the

affected area is causing the problem. But if screws are tight, I'd buy a new gasket. If the damage spreads, you'll need one eventually anyway, and then it might not be available. A new one will cost \$20 to \$30.

Dropping the pilot

I recently heard about a kitchen range that employs an electric igniter to light the gas burners rather than a conventional gas pilot. I would like to know more about it. Where can I write?—Donald Anderson, Burdick, Kans.

This innovation is now used only on self-cleaning models made by

Caloric Corp., Topton, Pa. 19562. Write to the director of advertising; I'm sure he will be pleased to provide full details. Suggested retail prices are in the mid-\$300 and upper-\$400 levels. With burner pilots eliminated, the ranges should use less gas. Although the igniters won't work during power failures, you'll still be able to light burners with matches.

Wireless

I have a Shetland heavy-duty floor scrubber. The control wire that operates the valve to release water from the canister has rusted off. I can't find anyone who can help me. Can you tell me how to fix this wire?—James Trumbull, Ridgway, Pa.

No, because it can't be fixed. It's an integral part of the dispenser. The whole dispenser has to be replaced, which will cost \$5 to \$10. Replacement is simple enough; you merely snap out the old dispenser and snap in the new one, running the wire in correct position. Write the company, furnishing the model number of your unit. If it can't send a new dispenser, it will tell you how to get one. The address is Shetland Floor Care Div., Shetland-Lewyt Corp., 700 West Tabor Rd., Philadelphia, Pa. 19120.

All wet

Dishes dried in our Waste King Universal dishwasher don't dry thoroughly. Many are pretty wet after washing. What is wrong?—Elmer Wohbach, Harbor City, Calif.

If all the dishes were wet, I might conclude there is a mechanical malfunction. But in your case I would examine two other possibilities. First, if the temperature of the water is not high enough, dishes will not dry thoroughly; the ideal temperature is about 160° F. Second, the door of the dishwasher should be opened as soon as possible after drying is done; keeping it closed allows condensation to form on dishes.

Address seeker

Several months ago we received a Magic Maid waffle iron as a gift. I have a complaint and want to contact the manufacturer, but no one can give me his address. Please help.—Lois E. Blumberg, Douglassville, Pa.

Magic Maid is a trade name used by Son-Chief Electrics, Inc., Winsted, Conn. 06098. ★ ★ ★

If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N. Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.



Use your SPARE TIME beat inflation with added income

You offer a service everybody needs . . . work part time or full time . . . own your equipment . . . keep all you earn . . . start with just a small investment . . . and we help you every step of the way!

Have your own money-making business and make the kind of income you probably thought impossible. You can when you clean carpeting or upholstery or walls with Von Schrader professional cleaning equipment. Every home, every building are potential customers. And every customer can become repeat business. The demand for on-location cleaning is growing so fast that how much you earn depends solely on just your time and effort.

Moreover, we help you every step of the way . . . just as we have helped thousands of others build money-making businesses for 40 years. Typical comments: "Cleaning is a very good business—have been most grateful for your advice and help. You have fine machines—can recommend them to anyone."—R. Herbst. "Never have we made this good a living and been so

content and happy."—N. Hanna. "Have all 3 machines and very pleased with each one."—C. Reiner. "You people sure helped me and I'll never forget it."—H. Kendall.

There are three easy-to-use Von Schrader machines. You need no special skills or education to operate them. (1) CARPET DETERGER®. Its performance cannot be duplicated by any other cleaning machine. (2) UPHOLESTERY DETERGER®. Using dry foam, cleans fabrics beautifully and safely. (3) WALL DETERGER®. Washes walls and ceilings 5 times faster than by hand—no dripping or streaking.

You can start with just one machine. Then, as your business keeps growing, you may want to add the other two and thus offer a complete cleaning service.

You pay no fees, royalties, sign no contracts. You own your equipment, the finest of its kind. Keep all you earn. And your investment is so small you may find it hard to believe. For complete information—without any obligation—send for booklet.

"Let me send you our free booklet that gives all the facts"

—Francis von Schrader, President

Read about the big demand for on-location cleaning, see why Von Schrader Detergers are the finest of their kind, how easy they are to operate, learn how other men have become financially independent, how Von Schrader helps you every step of the way. Fill in the coupon and send for booklet. Extra! Special Recorded Message included with booklet. Listen as Francis von Schrader talks to you personally about your growing future using Von Schrader Detergers.



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1065 Place, Racine, Wisconsin 53403
Please send complete information on Von Schrader Detergers. No salesman will call.

Name _____

Street _____

City _____

State _____ Zip _____



GFCIs: Is circuit breaker or receptacle better for you?

Since 1971, the National Electrical Code has recognized the need for ground-fault circuit interrupters (GFCIs, sometimes referred to as GFIs) in the home by establishing GFI requirements to better protect people against dangerous electric shocks. Two types of GFI devices permitted under the code are the GFI breaker that monitors the entire house circuit, and GFI wall receptacle. Both offer ground-fault protection, and both are being studied by contractors to determine which is most economical and dependable.

A GFI prevents electric shock due

The GFI receptacle at left monitors only what is plugged into it and not what is beyond on circuit. The breaker (right) continuously monitors accumulated ground fault currents.



to equipment failure. Unlike fuses and regular circuit breakers designed to protect house wiring and appliances, the GFI is intended to protect lives by instantaneously sensing ground faults at very low ampere levels and turning off power.

Both GFI breakers and receptacles have their advantages; which to use depends on your needs. A GFI breaker protects the entire circuit, but that can be a disadvantage because of nuisance tripping. A receptacle, such as Leviton's Sure-Gard shown here, monitors only what is plugged into it. Since GFIs should be tested monthly, it's a lot easier done with a GFI receptacle that is installed near the appliance.

—Ronald J. Landisi

Us Tareyton smokers would rather fight than switch!



**Tareyton is better.
Charcoal is why.**

Tareyton's activated charcoal delivers a better taste. A taste no plain white filter can match.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

King Size: 20 mg. "tar", 1.3 mg. nicotine; 100 mm: 19 mg. "tar", 1.4 mg. nicotine, av. per cigarette, FTC Report Oct. '74.

SAVE UP TO **\$150**
ON AUTOMATIC
TRANSMISSION REPAIR



TRANS-MEDIC

Before you have your transmission overhauled... try Trans-Medic! Trans-Medic eliminates slippage and downshifting, smooths rough shifting... cures sluggish action!

For really dirty hands... use

LAN-LIN



Gets down deep into skin crevices to get hands really clean! Removes oil, grease, stain, dirt.



BRAKE CLEANER

Degreases instantly and can be used without disassembling brake units. Quickly dissolves and flushes away brake fluid, oil and grease.

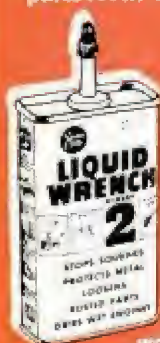
LIQUID WRENCH

Regular (No. 1) the super-penetrant that loosens rusted nuts, bolts and parts... in seconds!



LIQUID WRENCH

New (No. 2) stops squeaks, cleans and lubricates... protects metal tools, parts. Dries wet engines. Protects against rust and corrosion.



WRITE FOR CATALOG
RADIATOR SPECIALTY CO.
CHARLOTTE, N. C. 28237

Latest in loudspeakers



Acoustic
Research AR-10 π



Electrostatic
Research
ER-139



Yamaha NS-1000M



ESS "Tempest" bookshelf
line with Heil tweeters

After last year's flood of wild-looking speaker systems (page 122, Sept. '74) this year's new models incorporate more conventional-looking improvements.

Acoustic Research's new AR-10 π , for instance, has a woofer level control to maintain flat bass response wherever the speaker is placed within the room. The woofer, midrange and tweeter controls are easily accessible through a door in the front of the cabinet. The AR-10 π lists for \$395.

Yamaha's latest development is an ultralight yet rigid beryllium diaphragm dome used on the tweeter and midrange of its NS-1000M. It's made by depositing beryllium vapor on a balloon, which is then deflated. Per pair (note right and left-hand versions at top, right), they're priced at \$960.

The ER-139, from Electrostatic Research has eight small, electrostatic tweeters made from a new design by Arthur Janszen. The tweeter as-

sembly also spreads the downward-facing 10-inch woofer's rear radiation, while an upward-facing cone handles the midrange. Without cover grille, it's \$179.90; \$199.90 with cover.

ESS now has a series of four bookshelf speakers using the Heil "air-motion transformer" tweeter that squeezes out high frequencies instead of pushing them. The four "Tempest" models, from \$99 to \$199, are efficient enough to produce high volume from amplifiers of only 10 watts RMS per channel.—Ivan Berger

Off the road, on your own.



Chevy Pickup. Carries three with standard seating (bucket seats also available). GVW ratings up to 8400 lbs. with 4-wheel drive.



Handsome new interiors

This is Chevy's brand-new Silverado package with added insulation and other improvements for your comfort and convenience. Also available, depending on model: Cheyenne, new Scottsdale and Custom Deluxe interiors.

When you're in the back country where the road you're on is far from perfect, and far from town, it's good to have Chevy 4-wheeler durability and dependability going for you.

Choice of 4-wheel drives

Specify a V8 with Turbo Hydra-matic and you get Chevy's full-time system, drivepower at all four corners on and off the road. Or go conventional 4-wheel drive with a Six or a manual gearbox. Either way, Chevy 4-wheelers are low and easy to get in and out of, yet offer a full 7 inches of ground clearance.



Chevy Suburban. Carries nine with available seating. Or with only the front seat in position can move up to 144 cu. ft. of cargo.

High Energy Ignition

It delivers a spark that's up to 85% hotter compared to conventional systems; provides all-weather protection from moisture and dirt. Saves maintenance—no points or condenser to replace periodically. Standard on Chevy 4-wheelers.



Tough, double-wall construction

Chevy uses two walls of steel instead of one for strength, durability. In the hood. Front fenders. And other critical body areas.

Chevy Blazer. Carries five with available seating, plus 44 cu. ft. of cargo. Hardtop model has roll bar.



LASTING CHEVY VALUE

Chevrolet

'75 CHEVY

4-WHEELERS



The traditional plumed helmet
of an officer in the Royal Horse Guards.



Classically smooth. Unclassically priced.

You can buy a more expensive Canadian, but not a smoother one.

Windsor. A rare breed of Canadian.



manned space mission with a new accent

Half a world apart, on pillars of roiling flame, two Russian cosmonauts and three U.S. astronauts will lift off from Earth in their respective spacecraft on the 15th of next month if the plan goes according to schedule. Soyuz will rise from the Soviet launch complex at Baikonur, Kazakhstan, at 3:20 p.m. Moscow time. Seven and a half hours later Apollo will be inserted in a smaller initial orbit, along the same track around the Earth, on a Saturn 1B rocket from Kennedy Space Center.

Apollo, from its elliptical inside track, will juggle its orbit until—two days later—both craft are aligned. Apollo then will close in and the two craft will perform a tricky rendezvous and docking sequence at an altitude of about 140 statute miles. Crews will visit back and forth via a unique airlock tunnel, during which time each will be talking the other's language.

The American-Soviet link-up—a blend of hard work and sophisticated engineering—points toward even more spectacular cooperative space efforts in years ahead.

by Richard Dempewolf



Crewmen train in simulator at Star City center near Moscow. From left: astronaut Thomas P. Stafford, cosmonaut Aleksey A. Leonov and astronaut Donald K. Slayton. Illustration (top of page) shows how tapered petals will permit Soviet and U.S. craft to effect docking in orbit.

After two days, the vehicles will separate and redock, this time with the Soviet docking mechanism being the active one. Some 27 space experiments will be conducted; five of them jointly. The rest will be spread over Apollo's nine-day flight span. At the end of its fifth day from launch, Apollo will make a final separation from Soyuz and continue in orbit for another four days before landing in the Pacific. After the final undocking, Soyuz will circle the Earth for two days before parachuting home to Kazakhstan.

The Apollo-Soyuz Test Project (ASTP) is a \$250-million milestone in international cooperation. It was born on May 4, 1972, when the United States and the Soviet Union—until then space rivals—agreed to conduct the joint venture. Purposes of the mission will be:

■ To provide an international plat-

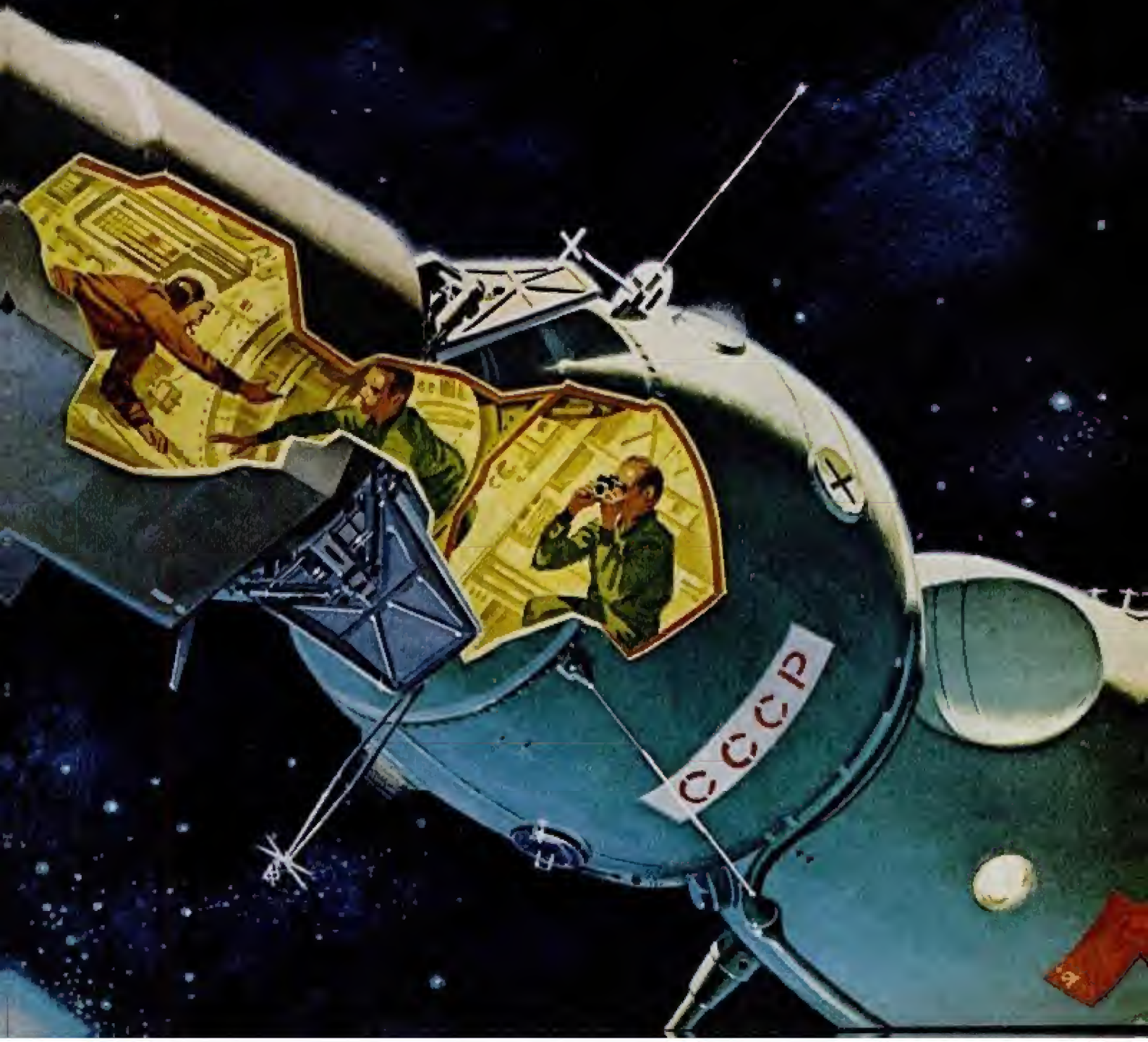
(Please turn page for full-color illustration; text continues on page 110)

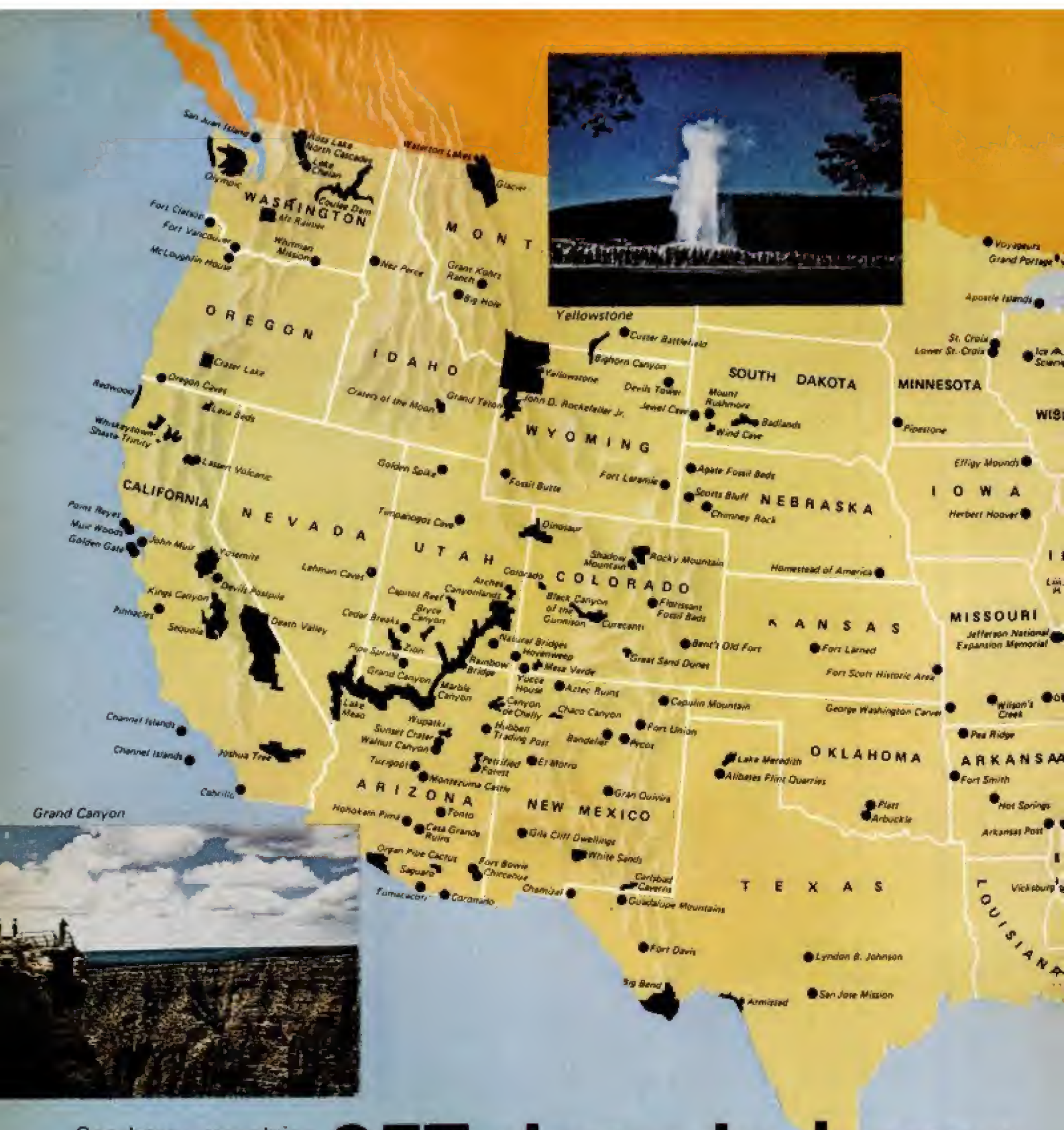


Apollo-Soyuz Mission Sequence

1. SOYUZ LIFT-OFF
2. SOYUZ ORBIT ADJUSTMENT MANEUVER
3. APOLLO LIFT-OFF
4. TRANSPOSITION
5. DOCKING
6. DOCKING MODULE EXTRACTION
7. APOLLO RENDEZVOUS MANEUVERS
8. SOYUZ CIRCULARIZATION MANEUVER
9. DOCKING
10. CREW ACTIVITIES
11. SOYUZ DEORBIT MANEUVER
12. SOYUZ LANDING
13. APOLLO DEORBIT MANEUVER
14. APOLLO LANDING

American and Soviet spacecraft will dock in an orbit some 140 miles above the Earth, as shown in this artist's concept. The two crews will work together in carrying out five scientific experiments.





Seashores, mountains,
deserts and lakes—
all offer unequalled
outdoor recreation.

257 close-to-home vacationlands— READY AND WAITING

by Jack Galub

Art: Adolph Bretman and Marian Manfredi



Acadia

No matter where you live, there are likely to be vacation spots within a day's drive from your home. Over 30.5 million acres and 29,000 developed campsites are within our national park system, and they offer unequalled opportunities for outdoor fun. Best of all, particularly nowadays, all these areas are yours to use at a price that's almost impossible to beat. Admission to any fee-charging facility runs from \$2 to \$4 for the family or carload. Overnight tenting fees are about \$2. And if you become addicted to visiting national parks frequently, as so many do, a \$10 Golden Eagle Passport admits you and your group free to any admission-charging area for a full year. If you've celebrated your 62nd birthday, a free Golden Age Passport may be picked up at any facility. Just present proof of age at the gate. You'll get all the privileges of the Golden Eagle plus a 50-percent discount on camping and other use fees.

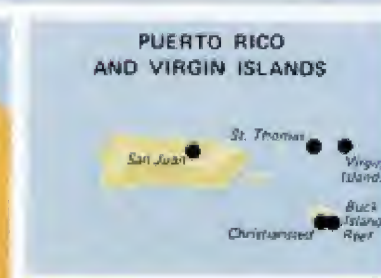
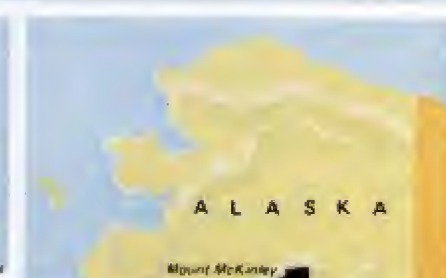
Grandfather of the system was Abraham Lincoln, who took time out during the Civil War to turn over Yosemite Valley and the Mariposa Sequoia Grove to California for use as parks. That was in 1864. Eight years later, President Grant approved the naming of Yellowstone as our first national park. Today, the system is recognized as one of the world's wonders, copied by more than 90 other countries.

The national park system, administered by the U.S. Department of the Interior, has 38 national parks (where no hunting is permitted), 16 recreation areas (many of which allow hunting), 10 national seashores and 81 national monuments. And the numbers keep changing and growing. Urban-area parks, such as Gateway in New York City and

(Please turn to page 128)



Everglades





1

LOW-COST LIGHT-UP Transform your yard into a night-blooming beauty

by Harry Wicks WORKSHOP EDITOR

Not too long ago, outdoor residential lighting consisted of little more than placing a few floodlights around the grounds in rather bare-looking fixtures. Usually, these functional lights were affixed to buildings or parked on poles to provide broad, general illumination for safety and security for family and visitors.

Though safety and security are both still good and valid reasons for lighting

your property at night, a third consideration — beautification — now plays an equally important role in outdoor lighting. Actually, "lightscaping" is simply an outside extension of indoor lighting. But if it's carefully done, you can add new dimensions to your home environment to create, in effect, a totally new living area.

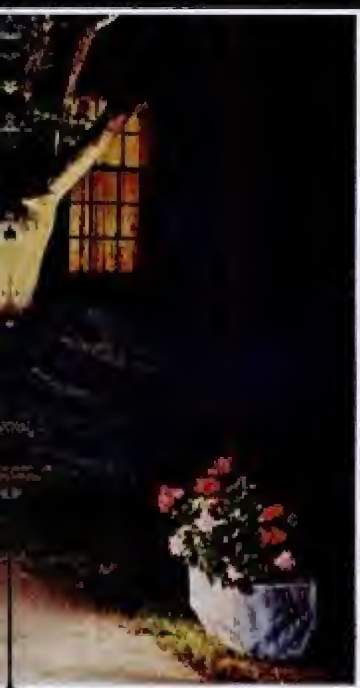
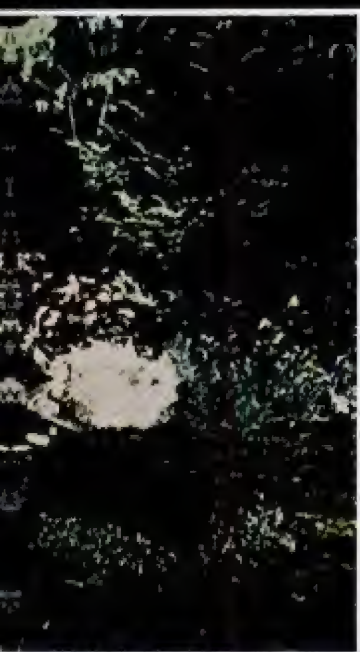
Don't think that lighting your property automatically means that you will

2



3

Used creatively, night lighting will beautify your yard as well as make it safer. The lighting shown includes: 1. Illuminated steps with light-distribution pattern that permits clear view along entranceway; 2. Underwater lighting with lily-pod fixtures; 3. Area lighting which emphasizes shadows; 4. Spotlight on a focal point; 5. Silhouetting dark objects against light, achieved by beaming light through translucent materials; 6. Pond illuminated by low-voltage incandescent at pond bottom; 7 and 8. Wall and ground-mounted fixtures for small-area lighting. Photos 1 through 6 are from General Electric Co., Nela Park, Cleveland, Ohio; 7 and 8 are courtesy of Intermatic, Inc., Spring Grove, Ill.



be using energy capriciously. For one thing, when exterior lights are turned on for outdoor family use, it means that indoor lights can be turned off or used minimally.

Additionally, you can save even more by installing a low-voltage outdoor system. How such systems work is explained on the following page.

This article shows you how to create attractive outdoor lighting effects—for greater safety and enjoyment—through the variety of fixtures and lamps now available. With these, plus a generous helping of your own imagination, you will be able to turn your backyard into a nighttime wonderland.

Basics of outdoor lighting

There is no great mystery to successful outdoor lighting, but there are basic principles you should know about. For example, be aware that it is important to avoid flat lighting—a look that is inevitable if you try to duplicate daylight. Instead, plan light placement so you create a scene with highlights and shadows that has a painting or sketch-like quality.

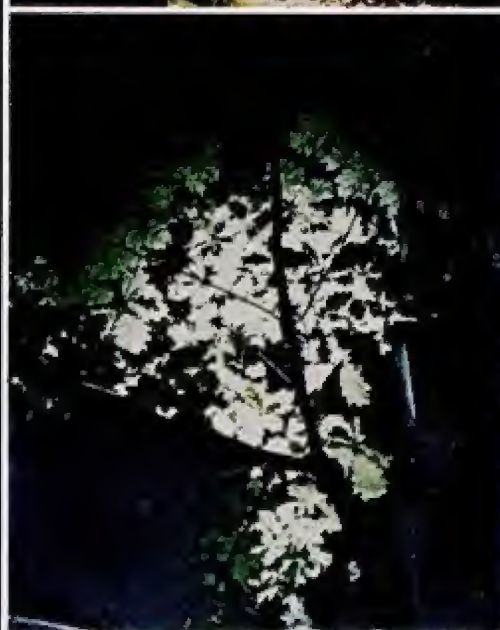
Generally, a touch of light here and there, cast by the appropriate fixture, is the kind of lighting that will give your nighttime setting a charm of its own. And that's what you should aim for—a look that is distinctly different from your yard's daytime appearance.

Shielding fixtures are frequently used today even though they're slightly less efficient and, thus, more expensive to operate. On the plus side, however, these do eliminate irritating glare yet provide illumination where

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Use lighting to create interesting forms



Rooftop view shows position of three 300-watt PAR units aimed at lawn and trees for dramatic effect.



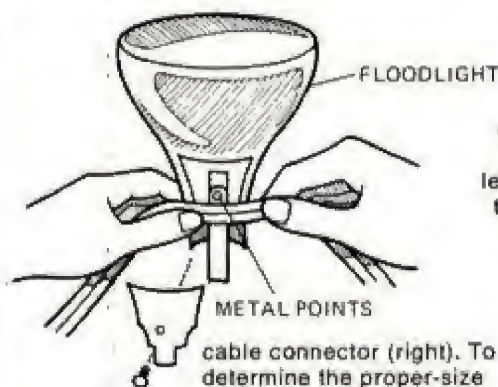
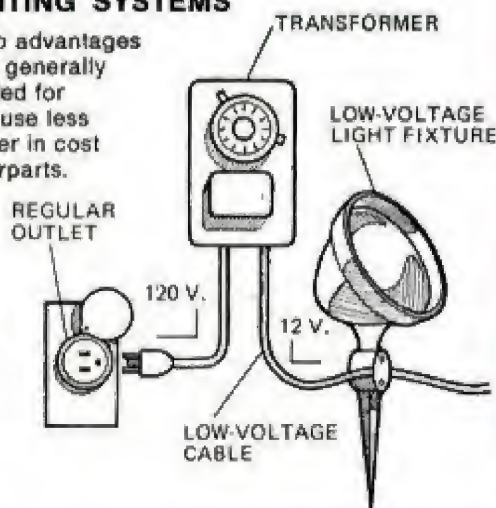
Bamboo trellis is cross-lighted by two floodlamps; 75-watt lamp adds interesting shadow shapes.

Art: Adolph Brotman

ABOUT LOW-VOLTAGE LIGHTING SYSTEMS

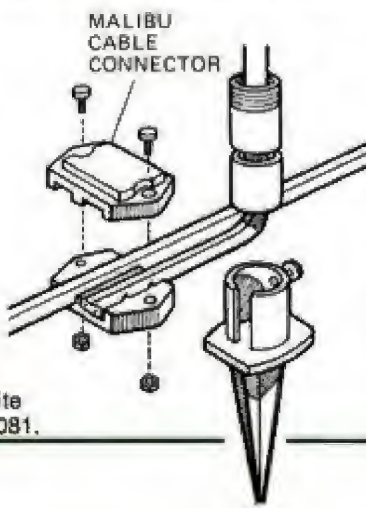
A low-voltage lighting system has two advantages—economy and safety. Such systems generally use low-wattage bulbs that are intended for accent lighting; these, of course, will use less electricity. The equipment is also lower in cost than comparable high-voltage counterparts. And you also save because ease of installation makes this a do-it-yourself task all the way. Safety is good because the transformer reduces voltage from the standard 117 volts to 6 or 12 volts. Dangerous shocks are much less likely.

The transformer is the heart of the low-voltage system. A simple device, it sometimes comes with a timer that automatically



turns lights on and off. The components shown are part of a system called Malibu. The cable can be attached to the floodlight with the floodlight turned on, as shown at left. Or you can attach the power cable to the short fixture cable using Malibu

turns lights on and off. The components shown are part of a system called Malibu. The cable can be attached to the floodlight with the floodlight turned on, as shown at left. Or you can attach the power cable to the short fixture cable using Malibu



it is wanted. Local or border lighting and spotlighting are usually based more upon esthetics than the ability to see.

One way to determine how and where to place various light fixtures is by working with long extension cords and incandescent lamps. By using this trick you can fiddle with a number of lighting arrangements until you find a setup you'd like to make permanent.

Play it safe. All electric fixtures and wiring used for outside lighting must be weatherproof and installed in accordance with the National Electric Code (as well as your local building department).

About outdoor lamps

Currently, many installations use a floodlight holder for incandescent lamps with built-in reflectors (PAR). Some holders shield the entire lamp so that indoor lamps can be used. Others shield only the lamp base; with these you must use outdoor (weatherproof) lamps.

Outdoor incandescents are available in colors if you want to emphasize color, control insect attraction or create special-effect foliage lighting.

Tungsten halogen lamps are generally tubular in shape. These longer-life incandescents are generally used in higher-wattage floodlights.

You can use fluorescents outdoors provided you meet three criteria:

- Use only weatherproof fixtures.
- Make certain ballasts and fixtures are designed for use at below-freezing temperatures.



Low-voltage units under an overhang light planters and rock garden; transformer is mounted in soffit.



Bug Chaser bulb above by Duro-Lite has a special yellow coating. GE border lights (left) seem to sparkle because of perforated housings. These are available in varied heights.

■ Lamps exposed to temperatures ranging from 32° to 50° F. must be enclosed.

High-intensity discharge lamps (HID) are used for floodlighting larger areas and are not commonly used in residential outdoor lighting.

There is a wide variety of lamps and fixtures available to suit all outdoor lighting needs; typical shapes are shown in the drawings at right and on page 117.

Ideas for lightscaping

■ **Automation.** Consider installing equipment which will turn lights on and off automatically. It is relatively inexpensive and can save many dollars over the course of a season by completely eliminating wasted electricity.

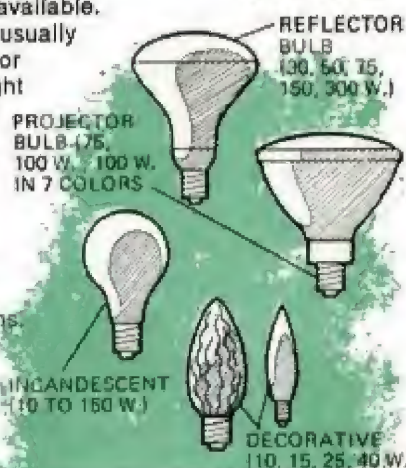
■ **Accent lighting.** Trees, shrubbery and the like can

(Please turn to page 117)

OUTDOOR LIGHTING FIXTURES AND KNOW-HOW

LIGHT BULBS

Many lamps and fixtures are available. Typical units shown here are usually made of brass, steel, copper or aluminum. Bulbs shown at right are the most commonly used 115-120-volt types. The reflector bulbs must be used in fixtures, while the PAR type (not shown) need no shielding because they are made of hard glass that will not crack or break due to weather or moisture conditions.



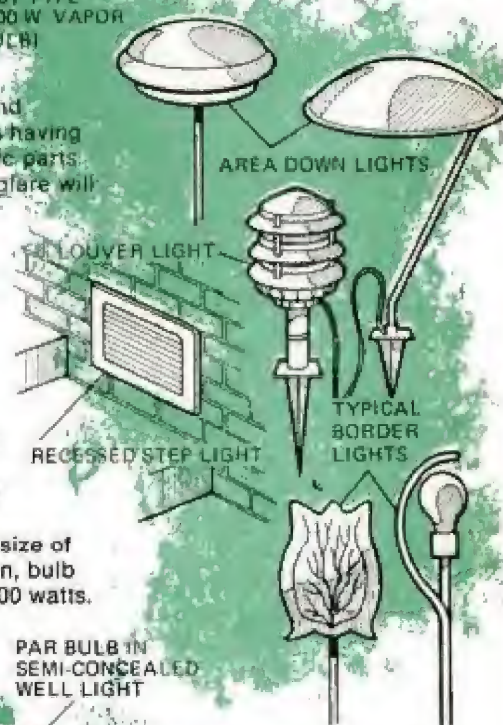
FLOODLIGHT HOLDERS



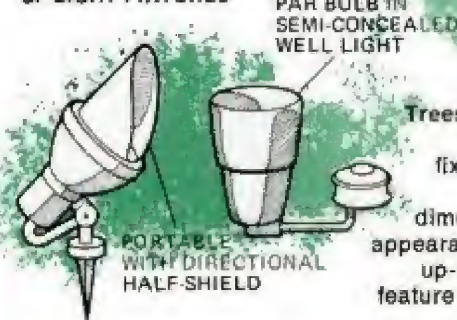
Floodlighting and spotlighting, either up or down, usually is accomplished with projector (PAR) bulbs in adjustable holders. Fixtures shown are widely used today. Two portables come with a cord and ground spike; others can be mounted on house or pole. Light with an adjustable height pole is ideal for large-area illumination.

BORDER AND STEP FIXTURES

To light steps, paths and borders, select fixtures having neither glass nor plastic parts, because the resulting glare will be annoying. Fixtures for this use range from 6 to 18 in. in diameter and 8 to 30 in. tall. From a wide selection you can pick fixtures that give down-lighting for steps, borders, low plantings. Designs vary considerably; simply choose fixtures compatible with your garden. Depending on size of fixture size and function, bulb sizes vary from 10 to 100 watts.



UP-LIGHT FIXTURES



Trees, shrubbery and fences are lighted by locating fixtures on ground, aimed upward. To produce a dimensional rather than flat appearance, direct two or more up-lights at an angle to the feature being specially lighted.

The miles per gallon

In the Shell
Marathon competition,
the current record
is 376.59 mpg!

by Michael Lamm WEST COAST EDITOR

What do you consider good gas mileage? The government wants Detroit to increase the average miles per gallon 40 percent by 1980. That means about 20 mpg from a full-sized Ford.

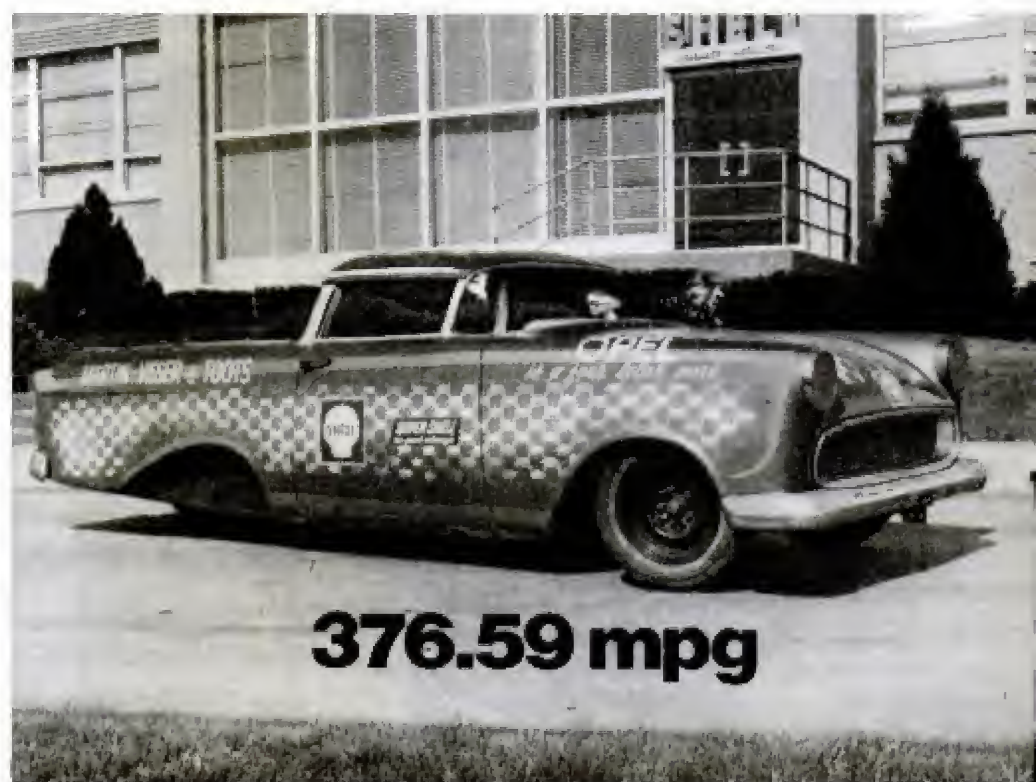
Twenty sounds pretty good for an LTD, but what if I tell you that in 1949 a Shell Oil engineer modified his two-year-old Studebaker Champion and got 150 mpg? That's right: 150 mpg. Not bad, you say.

Well, hang onto your hat, because that's not the record by a long shot. Shell started playing this little game back in 1939, letting its engineers tune and modify cars for maximum gas mileage. They called it "Marathoning," and they still do it every season. It's done in-house, not for publicity. Over the years, the mpg figures kept going up. The remarkable results are listed in the table below.

How do the competitors get that sort of mileage from their special cars? Two things are paramount: 1. Driving technique; 2. The way the car is set up.

Economy drivers have found that the best technique for racking up record gas mileage is to drive in bursts. Burst driving isn't practical on the highway, nor can you do it with power steering or an automatic transmission. But here's the way it works.

First, they accelerate with maximum throttle in high gear from 3 to 15 mph—in other words, holding the



376.59 mpg

gas pedal to the floor all the way. There's no accelerator pump in the carburetors of these record cars, so full-throttle acceleration doesn't waste gasoline.

When they reach 15 mph, they shove in the clutch, take the transmission out of gear, switch off the ignition, and coast back down to three mph. They repeat this cycle over and over for the duration of the test. Shell

Marathon participants average about six such cycles per mile and try to cover as much distance as possible on one measured gallon of gas. They drive a 14.067-mile circular route near Woods River, Ill. The course follows normal, typical roads and has uphill and downhill sections, but no stops.

Now preparing the car is another matter and perhaps more important. Let's look at two examples—the 1924 Chevrolet roadster that got 168.47 mpg back in 1952 (it set a record that lasted 16 years), and the current record-holder, a three-wheeled 1959 Opel that reached a phenomenal 376.59 mpg in 1973. Here's what their owners did to these cars.

The 1924 Chevy used its original 154-c.i.d., ohv, four-cylinder engine. This engine was completely taken apart, new sleeves installed and new two-ring aluminum pistons fitted for

(Please turn to page 122)

SHELL MARATHON MILEAGE RECORDS

Year	Car	Ton mpg	Actual mpg
1939	1933 Plymouth 6	71.6	49.7
1949	1947 Studebaker 6	240.0	150.0
1952	1924 Chevrolet 4	206.4	168.5
1968	1959 Fiat 600	186.9	244.4
1972	1959 Opel 4	306.7	297.7
1973	1959 Opel 4	451.9	376.59

game

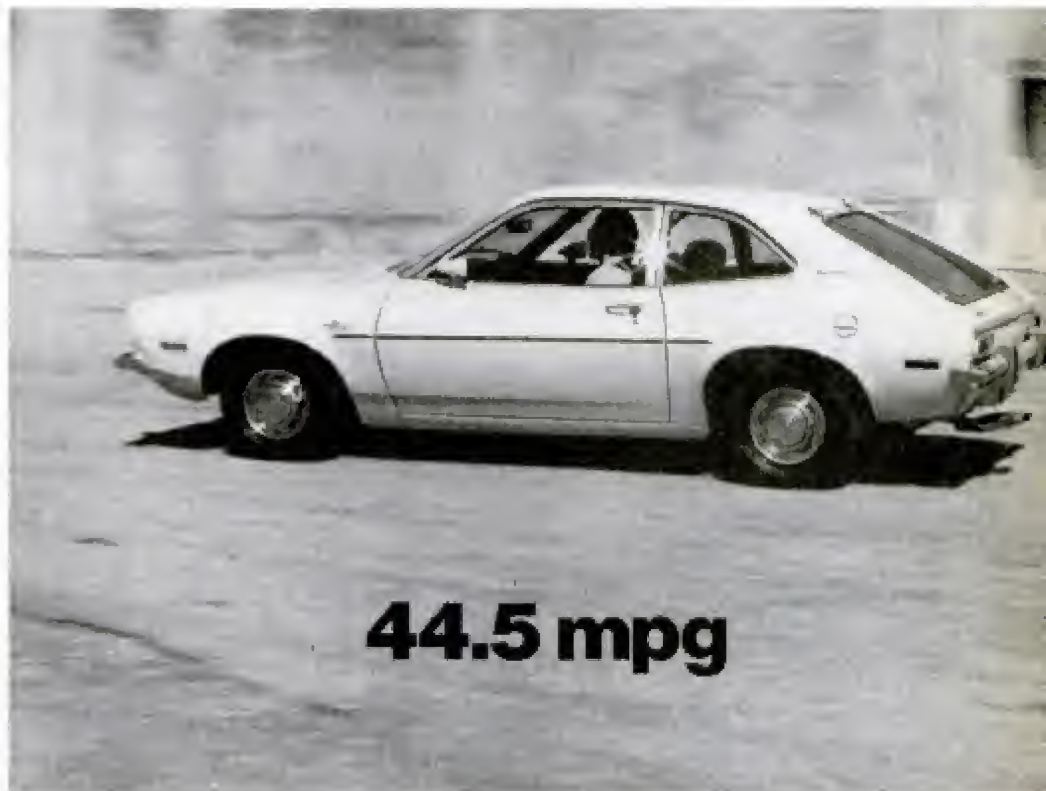
This owner boosted the mileage of his family Pinto to 44.5 mpg. Here's how he did it.

by Nils Nelson

Can a basic little economy car like Pinto be coaxed into giving you better gas mileage? After gas prices started climbing and we weren't even sure there would be enough gas to buy, I decided this was a question worth looking into.

I worked on the project carefully for eight months, and found that, yes, you can increase mpg substantially—without going broke, and with a minimum investment of time and not a whole lot of mechanical know-how. A 1973 Pinto Runabout with a two-liter engine, four-speed transmission and dealer-installed airconditioning was the subject of this experiment, but I'm sure any Pinto can obtain similar results. The filling method was to top up the tank until I could see it and just keep it filled to that point for each check on mileage.

Friction was my first concern. How much can we reduce it? Changing oil frequently not only reduces internal friction, but it also allows you to run cooler and prolongs the life of your engine. Check your transmission, rear end, and wheel bearings to make sure they are at proper levels and turning freely. Brakes are another source of friction. The self-adjusting drums in the rear and front discs all create some drag, but I will not sacrifice safety for no friction. What I did find was that one of my front discs had a rusty piston and was constantly dragging—enough to give me an increase of 2.5 mpg after it was repaired. This



The author's 1973 Ford Pinto was modified step-by-step for almost a 100-percent boost in fuel mileage at a steady 50 mph. The total investment in new parts was \$259.

is the kind of friction to keep a constant lookout for.

The first thing I did under the hood was change the air cleaner. It took some hunting to find one for the Pinto's little two-barrel, but there are several available. I bought a Cal-Custom. The car ran better, performed better and immediately gave me better mileage. Shortly after the air cleaner came a flexible-blade fan.

This fan weighs about half that of the stock item, drawing less power from that little four-banger. It flattens out at high speeds, drawing still less power from the engine and it cools better when idling in traffic because of the steeper pitch of the blades.

Again, there was better mpg. It was at this point that I decided to go for further mileage boosts: After all, if an air cleaner does that much, think about some sophisticated changes.

Ignition seemed to be the next likely place to improve economy. It figured that if you can burn gas more completely, you'll get more power and economy—you won't just be blowing it out the exhaust. The Nolan Technical Center in Dallas is the local distributor for the Geraghty Dyno-tune kits.

The kit has new wiring, weaker

(Please turn to page 123)

MILEAGE BOOSTS ON AUTHOR'S 1973 PINTO
(Starting Point: 24.5 mpg)

Parts Chained or Added	New Mileage (mpg at 50 mph)	Price of Parts (\$)
Air cleaner	29.0	10
Flexible fan	30.5	10
Electronic magneto	33.3	59
Ignition kit	36.5	50
Vapor injector	40.2	47
Headers, exhaust system	44.5	103
Total investment:		\$259



Free-breathing air cleaner installed by author netted him a gain of 4.5 mpg.



Cordless irons, clockwise from upper right, are: Ungar (in charger stand), \$26; Black & Decker (with plug-in charger), \$15; Weller, \$15; Wahl 7500, \$20; Wall-Lenk, \$21; Wen gun, \$20; and Wahl Quick-Charge in charger stand.

Soldering irons are just about the last power tools to go cordless—but they may be the most useful ones.

If you've ever used a soldering iron for any job besides electronic soldering at your bench—repairing ceiling fixtures, auto wiring, or connections inside a console TV—you'll appreciate the cordless irons' obvious advantages. But there are less obvious advantages, too. Even in bench work, an iron without a cord to trail across a crowded work surface, or to pull and twist when you're working in tight places, can be a boon. And since the cordless irons generate no electromagnetic fields, they're just perfect for soldering field-effect transistors, which could otherwise be damaged.

Not all cordless irons are alike—though there are significant similarities. Most of them weigh about 6 ounces—slightly more than a conventional iron and cord, but not enough so to be bothersome. They heat up in five or six seconds to a

How to solder when there's no place to plug in

Cordless, rechargeable soldering irons are popping up all over.

by Ivan Berger ELECTRONICS EDITOR

Even for benchtop jobs like this, where power is available, cordless irons are handy.





Tips for cordless irons come in many shapes and sizes. Wahl has largest choice, followed by Weller and Ungar.

For bench work, we preferred the drop-in charger stands of Ungar (below, with handy tip-cleaning sponge) and Wahl, (below left) to chargers that had to be plugged into irons (like that shown with Black & Decker's on the facing page).



Photos: Benn Mitchell



Switch locks on Wahl (right), and Lenk, Ungar and Weller irons prevent accidental heating or battery discharge. Black & Decker uses a switch guard instead; pistol grip protects Wen's trigger switch.

tip temperature of about 700° F., make about 100 joints per charge (depending on the size of the wires and your speed in making joints), and are good for about 500 to 1000 battery charge/discharge cycles before their built-in batteries need replacement.

All have built-in bulbs to illuminate the work as you solder. And all fall within a fairly narrow range of prices, from \$15 to \$26.

But the differences are also worth knowing before you buy. While most irons take overnight to charge, one—the Wahl Iso-Tip 7700 Quick-Charge—recharges in one to 4½ hours. And the power available differs from iron to iron, too. The Lenk and Black & Decker irons are about equal, at 10 and 12 watts; the Wen runs 15 to 25 watts; the Ungar, 35 watts; and the similarly named, similar-looking Wahl and Wall-Lenk irons, 50 watts each.

With the exception of the gun-style Wen, all the irons are pencil-shaped; but their balance and trigger locations differ, so heed the various models in your local stores to determine the ones that feel most comfortable.

For bench work, we preferred the Ungar and Wahl irons, whose handy stands recharge the batteries as you rest the irons in them between joints. Of the two, Ungar's stand was handiest, but the Wahl iron felt a bit better in my hand.

For getting into tight corners, the easiest irons were the Ungar, Black & Decker and the Wen, in about that order, followed by the Wahl with its optional tuner extension tip. Optional tips in different shapes and sizes were available for most models: Wahl, the original cordless iron, now offers five tips (which also fit the Wall-Lenk), while Weller and Ungar, the biggest names in soldering generally, offer four and three tips respectively.

Wahl is also offering a 12-volt, \$5 charger that plugs into a car's cigaret-lighter socket, as well as a portable carrying case that will protect the tip but is a tight squeeze for the iron.

Ungar gave us some useful tips on how to get the most from cordless irons: To make the most joints per charge, start soldering as soon as the iron is hot enough to melt the solder, and try to solder several joints each time you turn the iron on. Use your iron as much as possible, and discharge most of the way before recharging—the more you use nickel-cadmium batteries like the ones that are built into these irons, the greater amount of charge these batteries will hold. ★★★

Chevy, Olds, Pontiac



OMEGA

NOVA

No, they're not at all the same—at least not in a few important respects.

True, the 1975 Chevy Nova, Olds Omega, Pontiac Ventura and Buick Apollo do share identical body shells—the General Motors X-body. Also true, the engines are nearly the same in all cases—only Apollo offers the V6, while all four cars come with GM's 250-c.i.d. in-line Six and two sizes of V8s.

But several important differences become clear in our survey of Nova/Ventura/Omega/Apollo owners.

First, there's apparently a big difference in the way the four GM divisions put these cars together. Under workmanship, 54.5 percent of Ventura owners rated their cars "good to excellent." Among Nova owners, this figure drop-

Forecasters claim that today's compacts will be the full-sized cars of 1980. Maybe so. The swing to standardized body shells and engines is already under way.

Lots of owner complaints about having to take cars back for the same problem two, three, sometimes even four times.

ped to 39.8 percent (see summary table, page 78); the other cars also outperformed the Nova in workmanship.

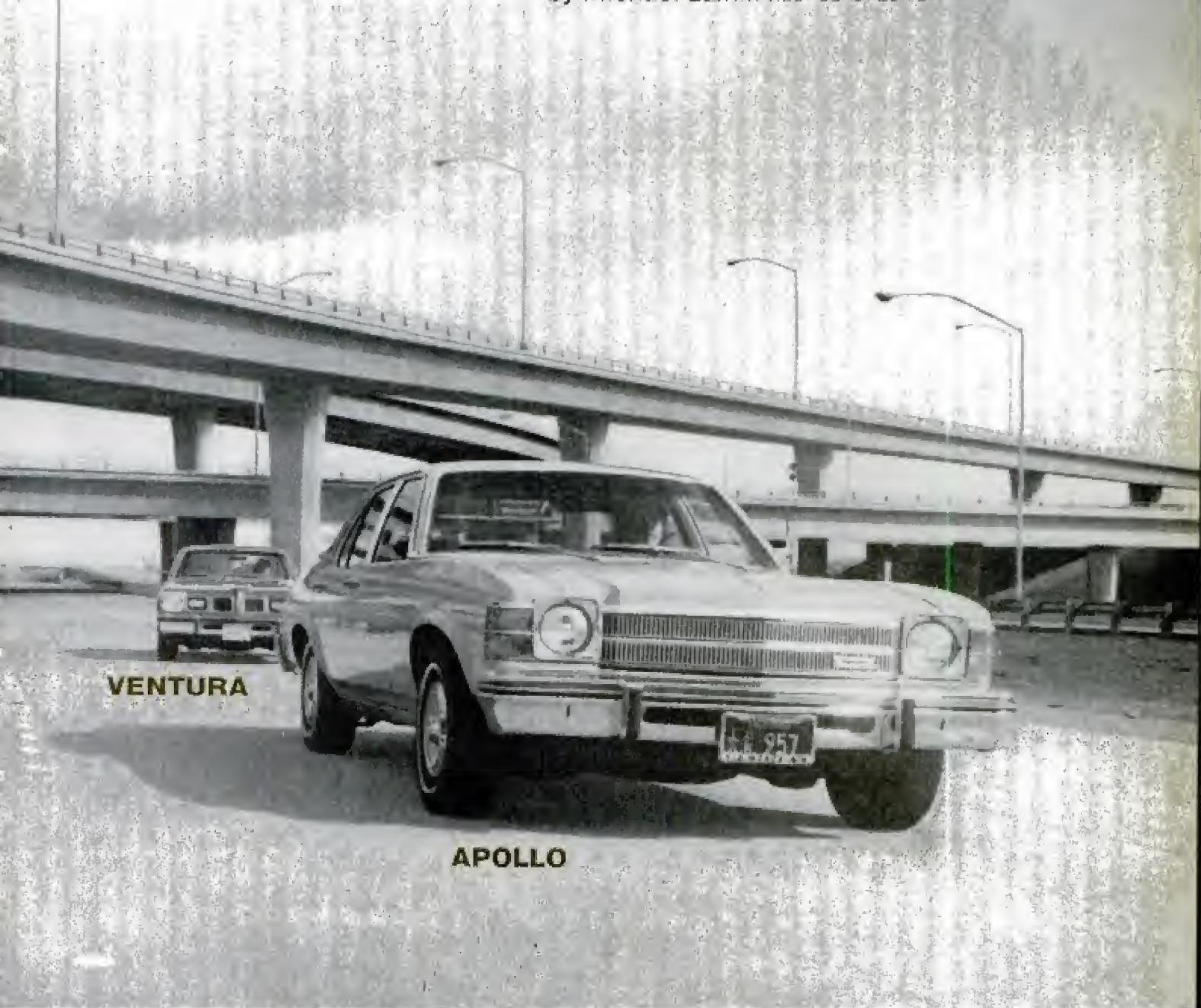
About mechanical problems, Nova owners reported the most—61.9 percent stating they had to take their cars back for service (much of it minor). Most trouble-free was the Apollo, with only 41.1 percent of owners reporting trips back to the dealer. Apollo owners also gave Buick mechanics highest marks for successful first-time repairs. They boasted not having to come back twice or a third time to get the same problem re-repaired.

Keep in mind these four compacts are relatively close in price. Least expensive is the Nova at \$3526 f.o.b. The Ventura lists for \$3623, the Apollo at \$3756, and the Omega is

and Buick: All the same?

A nationwide survey based on 1,283,000 owner-driven miles

by Michael Lamm WEST COAST EDITOR



VENTURA

APOLLO

the most expensive at \$3769. Only \$243 separates the top-priced Omega from the least expensive Nova. These figures are for base four-door sedans with the 250-cu.-in. Six.

Those, then, are the major factual differences plus those brought out in our survey. We'd hoped to find a clear-cut, consistent "winner" among these four cars, but no single victor emerged. The Nova managed to trail in enough categories so that its owners seem less satisfied than the rest—only 62.4 percent said they'd buy another.

We found it noteworthy, too, that most owners tended to be up in years—50 and above. Only among Nova owners did the 30-49-year age group predominate, and even that isn't young. The more mature ownership brings

◀ With options and taxes, these tabs rise to \$5000 range; we hear persistent grumbles that "cars simply aren't worth their price anymore."

Compromises, yes, but with genuine room for six passengers plus normal luggage—no need to carry around a lot of wasted overhang. ▶

with it some interesting trends.

For one, styling did not rank as a prime reason for buying any of the cars. Styling traditionally ranks No. 1 for U.S. cars (see previous Owners Reports). Instead, economy came in first as the principal reason for purchase of a GM compact. Styling became a secondary influence.

Owners chose automatic transmissions over manual three-speeds by an overwhelming majority. Ordinarily, in cars chosen for economy, we've found manual transmissions balance automatics to a much greater extent. Thus our overall conclusion: These cars were selected because they were *more economical* than cars owned previously. These compacts were usually purchased as *compromises* between

the large automobiles traded for them and the maximally economical subcompacts that were simply too small to suit drivers used to full-sized American cars. That's one reason "size" ranks so high under "Why did you choose this car?"

Here are typical comments from typical owners of all four nameplates. First, Nova:

From a New York college student: "There are eight members in my family, and although I can't get them all into my Nova at once, five passengers and I find the car comfortable front and rear. The only drawback is the way the shoulder belts are arranged. Anyone getting into or out of the rear practically hangs himself."

A printer from Franklin Springs, N.Y., notes, "I went to high-volume dealers in the city, got prices, then went to my small-town dealer here. I was treated better in Franklin Springs, plus getting the Nova \$400 cheaper with trade. This car is a real Chevy, so it's too bad they don't put decals on the air cleaner anymore and stamp 'Chevrolet' into the rocker covers. Also, I wish they'd offer a Nova wagon, preferably with vent wings and a four-speed V8."

RFD mail carriers usually know how to choose cars. Here's a rural mailman from Bennettsville, S.C., who comments, "I owned Chevelles previously; would have bought another if gasoline consumption were equal. The Nova's short wheelbase causes some pitching on rough roads. Gas mileage is good on the route for a 3500-pound car with the 262 V8, although smog controls seem to stifle the engine. It has a slight ping on leadfree gas, is hard to start and takes too long to warm up and run free. But it's a good-looking car and handles very well. The interior is fitted very well, materials are of good quality, and the rest of the car shows a good grade of workmanship."

From a retired gentleman living in Troy, N.Y.: "At 100 miles, I noticed oil leaking from my new Nova's engine. This is the 250-inch Six. Took the car back to the dealer and got

Rest assured that his oil leak wasn't something simple. This Chevy dealer was doing his level best despite delay.

Mercedes, BMW, VW, Volvo and others have managed to develop comfortable, simple shoulder harnesses. Why can't Detroit?

it back 1½ days later. Next day same leak. Returned car to dealer for another half day, and he said it was repaired. Next day oil leaked again. This time the dealer ordered me a new engine! At least he was trying! Four weeks went by and I got a note saying the engine had come in. Took car back, and they said it would be a two-day job. Fifteen days later, after lots of phone calls, I finally got the car back. The front end of my Nova is now covered with red paint spots, thanks to the dealer. My car is a light gray."

And a California construction supervisor observes, "My Nova's gas mileage is a far cry from the 15 mpg advertised. I'm getting about 11 in town. I used to get 16 mpg around town from my old Dart slant Six."

Turning to Ventura owners, this from a

Photos: Steve Pereira



Apollo's V6 beat the other GM engines in gas mileage; averaged 20.8 mpg in normal open-road driving.

These two cars were just a few inches longer than today's Ventura, and they delivered about the same fuel mileage.

Actually workmanship came in for drubbing from most owners, with Nova and Apollo rating lower than Ventura and Omega.

Jamaica, N.Y., secretary: "I wanted a reasonably small but not minute six-passenger sedan. Although I realize other carmakers offer such cars, too, I have had good success with Pontiacs. My car before this was a 1965 Tempest, and a 1950 Pontiac before that. Both wore very well. This car seems to fit my needs. But I did go to the Dodge dealer and looked at their Dart. I've since heard several Dart owners say they liked them, but when I was there it seemed that I'd have to buy a package of options to get a good deal. This would have meant paying more for the Dart than I paid for the Ventura."

Croons an Illinois retiree: "We particularly

Summary of Owners Reports on 1975 General Motors Compacts*

	Chevrolet Nova	Oldsmobile Omega	Pontiac Ventura	Buick Apollo		Chevrolet Nova	Oldsmobile Omega	Pontiac Ventura	Buick Apollo
Total miles driven	318,454	362,752	339,278	262,729	Four-door sedan	36.4	37.4	21.8	43.8
Average miles per gallon:					Three-door hatchback	20.3	21.3	20.2	18.0
250-cu. in. L6					Why did you choose this car?				
Local driving	15.0	14.8	14.8	—	Economy	32.4%	24.0%	34.8%	42.4%
Long trips	18.9	17.8	18.8	—	Styling	19.4	25.4	30.4	—
231-cu. in. V6					Size	18.6	28.1	23.9	33.8
Local driving	N.O.	N.O.	N.O.	16.6	Post experience	16.7	13.2	12.0	13.2
Long trips	N.O.	N.O.	N.O.	20.6	Price	—	15.7	16.3	—
260-cu. in. V8					Specific likes:				
Local driving	N.O.	14.4	13.9	14.1	Handling	53.6%	53.9%	48.2%	48.8%
Long trips	N.O.	17.4	17.9	16.7	Styling	30.0	35.2	42.7	33.3
262-cu. in. V8					Ride	25.5	29.7	23.4	23.8
Local driving	13.7	N.O.	N.O.	N.O.	Economy	18.2	18.0	20.0	20.2
Long trips	17.4	N.O.	N.O.	N.O.	Comfort	16.4	28.9	18.2	34.5
350-cu. in. V8					Size	10.9	—	—	—
Local driving	13.4	13.9	13.3	13.3	Specific dislikes:				
Long trips	16.8	17.9	16.1	17.1	Poor gas mileage	22.0%	20.6%	21.3%	24.7%
Engines:					Sloppy workmanship	12.8	13.2	13.0	14.1
250-cu.-in. L6	40.7%	35.8%	29.8%	4.7%	Poorly planned seat belts	10.1	8.1	9.3	—
231-cu.-in. V6	N.O.	N.O.	N.O.	25.8	Rattles	—	—	—	—
260/262-cu.-in. V8	21.2	35.8	36.8	29.2	Poor service	8.3	—	—	—
350-cu.-in. V8	35.4	26.1	30.7	38.2	Poor finish	—	—	8.3	—
Transmissions:					Tight legroom	—	8.1	—	—
Automatic	92.3%	95.7%	92.4%	97.8%	Poor-grade materials	—	8.1	—	—
Manual	7.7	4.3	7.6	2.2	Cold starts	—	7.4	—	—
Body styles:					What changes would you like?				
Two-door coupe	43.2%	41.1%	58.0%	38.2%	Better gas mileage	22.7%	9.1%	23.4%	14.7%

*Percentages might not equal 100% due to rounding or insufficient data. N.O.: Not offered. —Data not available or too small to tabulate.

love the appearance of our Ventura—red body with red-and-black upholstery.”

A Texas electronic tech isn't so taken. “I traded a 1967 Ford pickup with a worn-out engine. It got 13 mpg in town and 15 mpg on the road, which is exactly what my new Ventura gets. And to top it off, I now have to use unleaded gas at 2 cents more a gallon.”

A retired foreman in Saginaw, Mich.: “I've bought four Pontiacs from this dealer, and he's always been fair. I find this Ventura better than my 1970 Le Mans and equal to my 1967 Tempest. What irks me is my older passengers have to climb over and under the shoulder harnesses—it's a nightmare. The front buckets are very comfortable, but people get cramps in the rear. Handling is terrific, and I consider the corduroy velour seats very comfortable, especially in winter. My biggest complaint so far is sluggish acceleration with the 260 V8. And gas mileage, at 13 mpg around town, is not good.”

Now to Omega owners. From Nashua, N.H.: “As in all other Oldsmobiles I've owned, mechanical components seem to be above average and relatively trouble-free. For the do-it-yourselfer, most components are easily accessible for routine servicing. Sulfur dioxide from the exhaust does smell up the interior when idling in traffic—a price I imagine we all have to pay for catalytic converters.”

A Georgia Air Force officer added, “When I first obtained my new Omega, I noticed that the steering felt like it over-responded. On narrow, two-lane highways, I tended to drift off the edge. I understand that radial tires might be the cause. This is the first car I've owned with radials.”

A New Hampshire mechanical engineer said “I find the Omega overpriced at \$4578. I had to pay for an ignition interlock, which the factory installed at considerable cost and the dealer disconnected at an additional charge. I wish Nader and the Feds would get together so Detroit could stop adding this stuff and raising the price. The catalytic converter alone costs a fortune, and chances are

He shouldn't be so surprised. An in-line Six is inherently better balanced than a V8, so with today's lean fuel/air ratios, Sixes idle more smoothly.

Handling came in as top-rated “specific like.” Ease of parking and maneuverability in traffic received praise aplenty.

He certainly makes an important point. Compare prices with BMW, Mercedes, Jaguar XJ and the Volvo 264.

One owner predicted there'd soon be a market for gas masks for drivers doing a lot of heavy-traffic commuting.

they'll rescind that one, too.”

Turning to Apollo owners, a retiree from Hollywood, Fla.: “What I like best about my Apollo is the smoothness and silence of the motor. It's extremely quiet, indeed, considering it's a Six, not an Eight. Most V8s don't run so quietly as my Six. The one thing I dislike is that the engine is slow-starting, and it takes too long to warm up.”

A Buffalo cereal company employee: “Workmanship is average—numerous small dents, water in left front blinker, radio can't define stations, rear courtesy light cracked, paint dull in spots, unpainted other places.”

A hemodialysis specialist in Texas reports. “My Apollo is a common-sense car in that the Six offers gas economy, and my four-door is a lot roomier and less expensive than most imports of similar size. After shopping salesrooms of Audi, VW Dasher, Volvo, Datsun, Toyota and Ford, my Apollo spelled savings of \$400 to \$2600 for a car with equipment I wanted. The 1975 Apollo in Nov. 1974 was cheaper than any '74 imports I looked at. I'm very pleased and happy with this automobile and plan to keep it a very long time.”

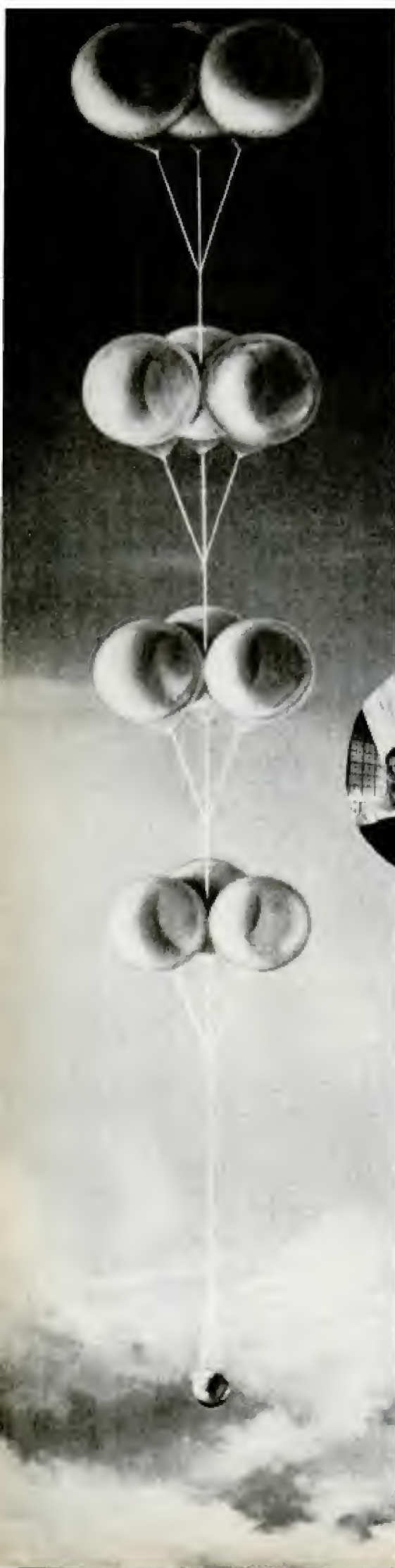
A draftsman from Queens: “Since GM has instituted a cash rebate policy, I feel I should receive at least \$100 back. I realize the rebates applied only to 1975 cars bought in February and March, but I bought my 1975 Apollo last October when sales were lousy. I didn't expect a rebate, but since they were handing them out in February and March, I think it only fair not to discriminate against buyers who stuck with Detroit through its hour of need.”

Finally, from a Texas personnel officer: “Put me down as a very happy Apollo owner. The service I've gotten from Buick since 1968, when I bought my first Opel, was the major factor in returning for this larger car. And no matter where I go in the U.S., Buick dealers have always been very helpful, courteous and reasonable in costs. I'll buy another Buick when I need to replace either the Opel or this Apollo, but I hope that won't be for many, many years.”

★ ★ ★

	Chevrolet Nova	Oldsmobile Omega	Pontiac Ventura	Buick Apollo
Revised seat belts	12.4	12.7	11.7	15.3
More legroom	8.2	10.0	—	16.7
Better workmanship	8.2	8.2	11.7	7.7
Better materials	7.2	—	—	—
More trunk/headroom	—	7.3	7.4	8.3
Number of vehicles owned:				
This car only	55.5%	52.5%	56.2%	45.1%
Two cars	35.3	34.8	34.4	38.5
Three cars	7.6	8.5	5.8	14.3
Four or more cars	1.7	4.2	1.6	2.2
Other cars owned:				
Chevrolet	42.3%	34.3%	17.3%	20.0%
Ford	7.6	7.5	11.5	—
Pontiac	—	—	25.0	—
Plymouth	—	11.9	—	—
Oldsmobile	—	32.8	—	8.0
Buick	—	—	—	24.0
Cadillac	—	—	9.6	—
Volkswagen	—	7.5	—	—
Comfort opinion:				
Good to excellent	54.5%	46.6%	59.3%	46.0%
Average to poor	39.3	33.0	31.1	34.0
Workmanship opinion:				
Good to excellent	39.8%	50.0%	54.2%	42.7%
Average to poor	40.2	50.0	45.9	54.4
Dealer service opinion:				
Good to excellent	30.4%	30.0%	—	—
Average to poor	69.5	70.0	—	—

	Chevrolet Nova	Oldsmobile Omega	Pontiac Ventura	Buick Apollo
Had any mechanical trouble?				
Yes	41.9%	46.0%	51.7%	41.1%
No	38.1	54.0	48.3	58.9
Type of trouble:				
Carburetor	24.7%	11.1%	6.6%	10.8%
Transmission	14.4	7.9	8.2	10.8
Cold starting	9.6	15.9	6.6	10.8
Electrical	—	—	18.0	—
Brakes	—	9.5	—	10.8
Dieseling	8.2	—	—	—
Speedometer and cable	—	—	8.2	13.5
Power steering leaks	—	7.9	—	—
Did you repair it yourself?				
No	98.6%	98.4%	98.3%	97.2%
Yes	1.4	1.6	1.7	2.8
Dealer repairs satisfactory?				
Yes	58.2%	59.6%	61.8%	65.5%
Dealer repairs satisfactory?				
No	41.8	40.4	38.2	34.5
Age distribution of owners:				
15-29 years	27.4%	26.9%	30.2%	12.9%
30-49 years	41.5	27.5	27.7	34.9
50-plus years	31.1	45.6	41.0	52.2
Would you buy another?				
Yes	62.4%	71.8%	73.0%	73.9%
No	37.6	28.2	27.0	26.1



Launch that failed: Forbes (left, below) and Heinsheimer chat before their aborted attempt early this year. Artist concept of the *Windborne* depicts 60-story-tall cluster of balloons designed to carry them across the Atlantic.

1975



1973

Aloft for 23 hours, Bob Sparks in the *Yankee Zephyr* was forced down off Newfoundland by severe storm, later picked up by Canadian Coast Guard.

Transatlantic balloon jinx Who'll be first to beat it?

In 100 years, there have been seven unsuccessful attempts and five deaths. Bob Sparks will make his second try this summer.

by Paul Wahl

Nobody has ever crossed the Atlantic Ocean in a balloon, even though such a flight has been possible since the mid-19th century. Misfortune has befallen all who have tried. Thirteen balloons, at least,

have been prepared for the voyage, yet only seven have gotten off the ground on the actual flight.

Five aeronauts lost their lives in three of four such tries since 1970. Malcolm Brighton, Rod and Pam Anderson aboard *The Free Life*, Tom Gatch in *Light Heart*, disappeared without a trace. Bob Berger's *Spirit of Man* crashed shortly after lift-off when the balloon burst. Of this group Bob Sparks is the sole survivor.

Soon, on an early summer day, when the weather is fair and the breezes are right, Sparks will climb into the gondola of a huge red, white



No trace was ever found of *The Free Life* flown by Rod and Pam Anderson, Malcolm Brighton. After 30 hours, they radioed ditching in heavy rain off Newfoundland, were never heard from again.

1970

and blue balloon, with the name *Odyssey* on its rain skirt, and take off alone on the flight of his life—challenging the transatlantic balloon jinx again.

A native Virginian, Bob Sparks, at 39, is one of the world's top balloonists, having logged some 700 flights on hot air or gas. He barnstorms the country with the Lark balloon and is the man you see flying it in all those cigaret ads.

Pictured on this month's cover, the new *Odyssey*, aside from increased gas capacity, is essentially the same



as the 73,000-cubic-foot *Yankee Zephyr*, flown in Sparks's unsuccessful 1973 transatlantic attempt. Both were designed

by veteran balloon expert Mark Semich and built by Semco Balloon Inc., Griffin, Ga.

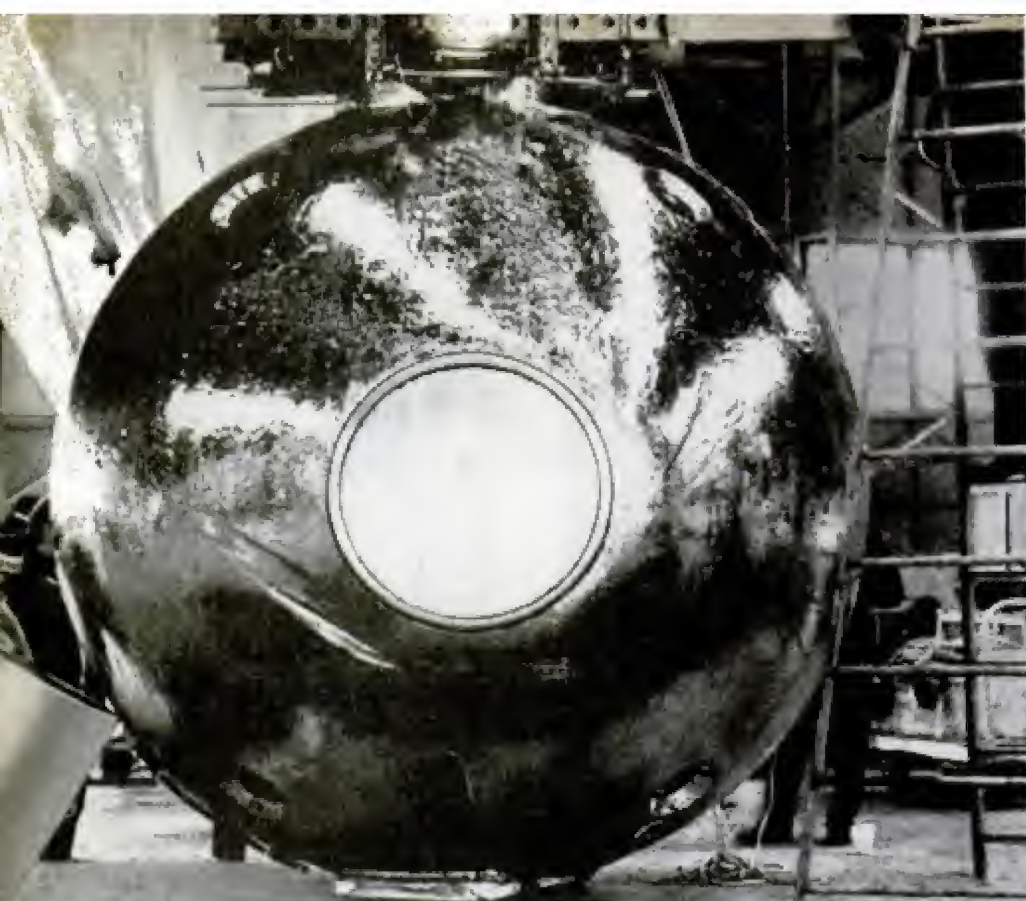
Ninety-two feet tall, almost as high as a 10-story building, the *Odyssey* is a constant-temperature helium balloon. Its 100,000-cubic-foot gas bag is a 58-foot-diameter, nylon globe retained inside a natural-shape envelope like that of a hot-air balloon.



1873 First transatlantic attempt was made by Washington Donaldson, Alfred Ford and George Lunt in the balloon *Daily Graphic*. Taking off from Brooklyn, N.Y., they got only 60 miles away before being forced down in raging storm at New Canaan, Conn.

At the mouth of the outer envelope, a small propane gas burner heats the air inside as needed to maintain the helium at constant temperature and lift—that's important to long-distance flight.

Backing up the constant-temperature system is recoverable ballast, a 500-foot cable strung near the end with thirty 24 by 5½-inch sections of PVC pipe fitted with end caps. Should the balloon start to descend, the pilot can put this drag line on the water and, if necessary, keep going that way for many days. When ballast is required again, the drag



1975 Slightly damaged gondola of Forbes' *Windborne*, salvaged after near-tragic launch failure, may fly again—but with new, less-complex balloon system.



1958 Seaworthy gondola saved lives of *Small World* crew. After ditching in Atlantic, they sailed 1500 miles to safety at Barbados.

line in winched up to the gondola.

Attached to the rigging is the load ring from which the gondola is suspended by nylon webbing straps fitted with parachute-type Capewell disconnects for quick release in emergency. Previously used in the *Yankee Zephyr*, the gondola actually is a seaworthy boat, 14½ feet long, with a beam of 7 feet and a height of 3 feet. With a sea sled's inverted "V" hull, made of lightweight aluminum with foam flotation inside, the boat is self-righting and self-bailing. Aboard are mast and sail, in case the voyage should go from air to sea.

1844

Courtesy, American Antiquarian Society



The Great Balloon Hoax

On Apr. 13, 1844, a jubilant *New York Sun* thought it had scooped its competitors with an "exclusive" story of a dramatic transatlantic balloon crossing plus an illustration. Irate *Sun* editors, checking, found the story an elaborate hoax contrived by that strange genius of American letters—Edgar Allen Poe.

For communications and navigation, the *Odyssey* will have advanced avionics equipment including radios, transponder, loran and emergency locator transmitter. It also will carry oxygen equipment for high-altitude flight, ample supplies for a long journey, and elaborate survival gear.

Sparks's departure will be timed to follow a westerly (eastward-moving) pressure cell to provide prevailing wind and to avoid rainstorms. Normal wind line due east from the Massachusetts launch site should deliver the *Odyssey* somewhere in



1974 Second fatal attempt last year occurred Aug. 6 when Bob Berger's *Spirit of Man* plunged into Barnegat Bay, N.J., shortly after lifting off from Lakehurst, N.J. Apparently, the homebuilt balloon had burst.



1973 "Hands off!" commands astronaut Bob Sparks, and the ground crew releases his ill-fated balloon *Yankee Zephyr*. Undaunted by this 1973 experience, Sparks will try to cross the Atlantic in the *Odyssey* early this summer.

France—with the flight roughly following Lindbergh's transatlantic course. During the flight, altitudes as high as 15,000 to 20,000 feet will be reached. Speeds should average about 30 mph. The voyage of perhaps 3500 miles could be completed in less than a week.

Talk of flying across the Atlantic began soon after man's first free balloon flights in 1783 in France—although the longest of these covered only three miles. Writing to a friend in France, on Apr. 4, 1784, George Washington having read newspaper accounts of the new balloons, predicted: "... our friends at Paris, in a little time, will come flying thro' the air, instead of ploughing the ocean, to get to America."

As gas balloons were improved and pilots gained experience, longer flights became practicable.

Having observed strong westerly air currents at higher altitudes, balloonists became convinced that they could ride these winds across the ocean to Europe in a matter of a few days—and some wanted to try.

In 1836, Charles Green, England's leading aeronaut, was the first to announce the intention to make a transatlantic flight on the westerlies. Later, he displayed a model of the

"Atlantic Balloon" designed for his New York-to-London journey. Although Green's project never went beyond the planning stage, it may have inspired Edgar Allan Poe's famous "Balloon Hoax" of 1844.

John LaMountain's *Atlantic*, completed early in 1859, was the first balloon built for transatlantic flight. With a small lifeboat slung under the basket, it was 130 feet high, 60 feet in diameter, and held 60,000 cubic feet of gas. While it never attempted the voyage for which it was designed, the *Atlantic* did make two spectacular and historic flights.

On July 2, 1859, John Wise joined LaMountain, his backer O. A. Gager, and reporter William Hyde, aboard the *Atlantic* for a shakedown flight, St. Louis to New York, before the upcoming ocean crossing. The balloon took off, headed northeast, climbing as high as 10,000 feet, crossed Lakes Erie and Ontario, flew through a heavy storm, and crash-landed in woods near Henderson, N.Y., on the eastern shore of Lake Ontario. The *Atlantic* was badly damaged, but those aboard were unhurt.

Scientific American, on July 16, 1859, reported this flight lasted 19 hours and covered 1150 miles. The

(Please turn to page 129)



Light Heart: Thomas L. Gatch took off from Harrisburg, Pa., Feb. 18. He was last sighted three days later over the North Atlantic 1000 miles west of the Canary Islands.

1974





**Instead of trading,
try replacing...**

A new engine can save old Betsy

by Robert Lund

Would you put \$500 to \$700 in your old car to get another 125,000 to 150,000 miles out of it?

That's what it would cost to replace the engine.

You can put new life in an old car for a lot less than \$500. For something around \$200—less than that if you do the work yourself—you can buy new tires, a tune-up, have the brakes relined and take care of any minor mechanical repairs. But \$200 will buy only an additional 20,000 to 30,000 miles. A new engine will buy as many miles as you got out of the car when it was new.

A new engine is a pretty good buy when you look at prices of new cars. Any new car will set you back a minimum of \$3000. A replacement engine will give you as many miles of transportation as a new car for a fraction of the price of a new car.

But there's another side to the coin. If your car has reached an age where the engine is shot, the car is probably showing its age elsewhere. Body rust, for example. Even if you replace the engine, you will still need tires, maybe a brake job and a general fixing up. But these items are considered routine maintenance and you would have to pay for them, new engine or not.

New engine or new car?

If you add the price of a new engine to what you would receive for

your old car on a trade-in, you will probably have enough to make the down payment on a new car. You will still have to make payments for X number of months. As you build equity and the new car becomes an old car, you can trade in three or four years for another new car.

If you go for a new engine instead of a new car, the initial outlay will be much smaller, you won't be making payments for the next three years or longer and you should save on insurance premiums. On the minus side, an old car with a new engine won't bring much more than an old car with an old engine if you decide to trade in a few years. Used cars sell largely on appearance, not on mechanical condition.

But if you really like your present car and plan to keep it another four or five years, a new engine is a good investment.

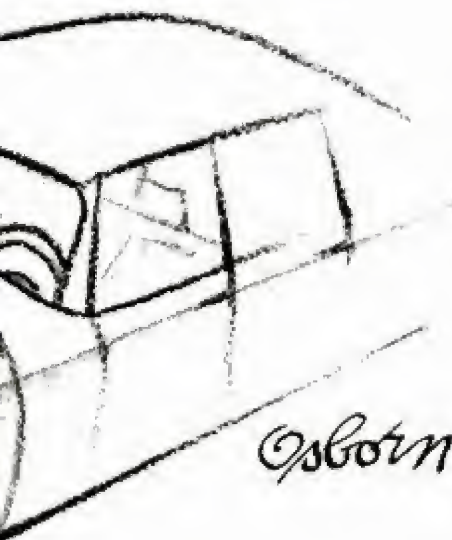
There are several sources of supply for replacement engines. You can buy an original equipment engine—same everything as in a new car—from the auto companies. These engines are sold through automobile dealers. Detroit doesn't sell direct to individuals. You can also buy from the big mail-order houses, Sears and Wards, from jobbers who sell automotive parts, engine rebuilders and service outlets all of which specialize in replacement engines.

There are three types of replacement engines: factory originals, re-

Engine swap at a pro shop . . . almost a day's job



It takes a professional almost a whole day to do the job. At the Michigan Motor Exchange, Vaughn Hayes shows how the engine is replaced in a '69 Skylark with 350 V8. Before chain is hooked to lifting rig on this engine (left), the following is done: Hood is removed, fan and radiator hoses removed, radiator removed (not necessary, but it gives you more room to work), alternator and air-conditioner removed, power steering disconnected. Throttle linkage and other connections are removed. The car is then raised for access to the underside: Transmission housing bolts are removed, starter and exhaust removed, torque converter and engine mount-



Engine replacement used to be a standard Rx for owners of tired cars. All the old-timers needed was a block and tackle and a big shade tree.

remanufactured and custom rebuilds.

Don't let the word remanufactured scare you and don't be misled by Detroit propaganda you may have heard about the dangers of using other than "genuine factory parts" in your car.

A remanufactured engine consists of a core that is put on a production line and rebuilt to original equipment specifications. The reputable remanufacturers are actually licensed by the car factories. That is, the car-makers tell the remanufacturers what they must do to bring the engines up to original equipment specs. All engines sold by mail-order houses are production-line rebuilds.

The third type of replacement engine is a custom rebuild. Replace-

ment is a misnomer because the engine isn't replaced. It's rebuilt. A mechanic pulls the original engine out of the car, rebuilds it, then puts the same engine back in. Most custom rebuilds are turned out by parts wholesalers and jobbers who operate rebuilding shops. There are some 6000 to 7000 custom rebuilders around the country.

If you want to do your own custom rebuilding, you can buy a kit with necessary parts from an auto-supply store or mail-order house.

The replacement engine business has a lingo of its own and it's important to know the language before you buy an engine or tackle the job yourself. If you don't know the language, you can be swindled or make trouble for yourself. Such as dismantling the engine—if you do the work yourself—and then discovering you don't have all the parts to complete the job.

There are different types of replacement engine packages within the three categories—original factory engine, remanufactured and custom rebuilt. The four basic packages are:

Package A, also known as a complete engine assembly. This is the best, most expensive, most complete replacement engine you can buy. You get about 250 new parts.

Package B, also known as a block assembly. You don't get as many parts as in an A package and some of the replacement parts are remanufactured, instead of new parts as in an A package. The block assembly does not include cylinder heads, rocker arms, oil pan or front cover, which are salvaged from the old engine.

Package C, also known as a short block, next step down from the B package. Fewer parts than in a B. The C deal does not include cylinder heads, oil pump, pick-up pipe, lifters, front cover, pulley or installation gaskets. Again, these parts are salvaged from the old engine and used on the replacement.

Package D, the rebuild-it-yourself

kit. Different kits contain different items. The Sears kit contains pistons, pins, rings, pin bushings, a reconditioned camshaft with bearings, oil pump, hydraulic or mechanical lifters, timing chain or camshaft gear and crankshaft gear, connecting-rod bearings and all seals and gaskets.

How do you decide among A, B, C and D?

One way is by price. A is the most expensive. B costs less than A. C costs less than B. D is rock bottom.

If you're considering a replacement engine, chances are you have taken care of your car. If that's the case you can rule out the A package. You don't need 250 new parts. Many of the original equipment parts are still usable. This narrows the choice to a B or C package if you are going to hire the work done.

Scott Connor, a consultant to the Automotive Parts and Accessories Assn., says replacement shops prefer to sell the bigger packages, the A or B, rather than the short block C. This isn't necessarily a case of oversell, of pushing more parts than the customer really needs, Scott explains. "The more precision work you take out of the hands of the mechanic, the less likelihood there is of making a mistake, of something going wrong."

Prices of replacement engines vary all over the lot, depending on the type of engine, what's included or left out of the package, the honesty/dishonesty and the competence/incompetence of the shop doing the work, make of car, whether the original engine was a Six or V8, the labor rate in your part of the country and a dozen other shakes of the dice.

Rule No. 1 in buying a replacement engine is to avoid the guy with the lowest price in town. Beware of the deal if you are quoted a price under \$300 including labor. The exception to this rule would be a custom rebuild done by an experienced mechanic with whom you have a personal relationship. He may be



ing bolts removed. The old engine is then lifted out. The new engine, shown at left, is prepared for installation. First, parts that can still be used are transferred from the old engine to the new one. Some of these include front cover, water pump, oil pump, oil pan, distributor, intake manifold, fuel pump, carb linkage, valve covers, flywheel. The new engine is lowered into place as shown at right. A jack under the transmission supports it during this step. When engine and transmission are lined up, the upper transmission bolt is connected. This is a key step. After the engine is positioned on its mounts, everything is reconnected.



able to do the job for less than \$300. The less you pay for a replacement engine, the more likely it is to blow up. Blowups are not uncommon on cheap jobs. It is almost impossible to get your money back on a blow-up, even if you hire a lawyer, because there are a hundred ways the shop can weasel out of responsibility.

The highest priced replacement engines are those sold by the auto companies through car dealers. Here are some typical prices for short block factory engines:

V8	
American Motors	304 c.i.d.: \$655.99
Chrysler	318 c.i.d.: \$751.40
Ford	351 c.i.d.: \$620.40
GM	350 c.i.d.: \$586.30
Six	
American Motors	232 c.i.d.: \$547
Chrysler	225 c.i.d.: \$329.37
Ford	250 c.i.d.: \$503.90
GM	250 c.i.d.: \$564.55

(Don't get sore at the dealer if he quotes prices higher than these. The auto companies are increasing prices of replacement parts, just as they have increased prices of cars, and the dealer may have had a price increase by the time you read this.)

Prices of replacement engines sold by car dealers are suggested list. Same as an automobile. This means the price is negotiable between dealer and customer. If a dealer is trying to increase his replacement parts business, he might be willing to shave something off list price.

Replacement engines sold by mail-order houses are cheaper than those sold by automakers. It isn't possible to draw a comparison between Detroit prices and mail-order prices for several reasons. The mail-order houses do not sell engines for cars made after 1973. Prices quoted in mail-order catalogs run about two years behind the current model year.

Mail-order houses list two different prices for every engine they sell: a complete price and then a second something-off the complete price, depending on what they can salvage from the old engine. Salvaged parts have to be returned to the mail-order house—at your expense. The parts are then put through a remanufacturing process and used on other engines.

To find out what a mail-order engine would cost, for your car, get the catalogs. They list complete engines, block assemblies, short blocks and rebuilding kits going back to 1942. Sears alone lists more than 250 engines in its current catalog.

Your next choice, if you don't want to buy an original factory engine or mail-order engine, is a parts

jobber, local rebuilding shop or an engine replacement shop. Prices of engines sold by these sources are generally on a par with each other.

One of the leading rebuilding/replacement shops in the Detroit area, Michigan Motor Exchange, charges \$335, plus labor for a 307-c.i.d. Chevrolet V8, and \$295, plus labor for a 250 c.i.d. Chevy Six. The labor rate for installing the Eight is about \$125 and around \$115 for the Six.

The labor rate is an important factor. Regardless of where you buy the engine, you will have to pay to have it installed if you don't do the work yourself. Labor rates vary around the country, from a low of \$8 an hour in some rural areas up to \$20 an hour in some cities.

An experienced engine man can pull an old engine out in an hour and a half to two hours and install the replacement in three to four hours. That's assuming the mechanic doesn't run into complications when he gets into the job—which can double these time allowances. The car manufacturers figure about seven hours of labor to pull

If you like your present car and plan to keep it another four or five years, a new engine is a good investment.

and replace a Six and around nine hours of labor on a V8.

Some shops offer one-day service. But that's pushing it. Most shops like to keep the car two to three days to cover themselves in the event they encounter problems or if they have to send out for parts.

As in any trade, there are bumbler and outright crooks selling replacement engines. Here are some of the shady tricks to watch for:

■ **The low-ball quote.** The shop quotes a bargain price on the engine to get your name on the dotted line. Then they drop the other shoe—the labor charge. "We can't give you an exact price on labor," the salesman fudges "because we won't know what we will get into until we tear out the old engine." This is a sucker deal. Don't sign.

■ **Low-ball quote No. 2.** The shop quotes a price for both engine and labor, but there's a footnote saying the price is based on the pull-out engine having a rebuildable core. If the core isn't salvageable, the replacement engine will cost more. Again, don't go for the deal. Demand a yes or no decision on the core before you sign up.

■ **Cheating on parts.** There are ump-

teen ways of cheating on parts, and the flim-flam is difficult to detect. Once the engine is in the car, the customer has no way of knowing what he got for his money short of tearing the job down and examining the individual pieces. Did the mechanic use new parts, used parts, remanufactured parts, parts pulled off a junked car, carry-over parts from the old engine and, if so, were the carry-overs trued up?

"Know what you're getting and get it in writing." That's the advice of all the experts—the Automotive Engine Builders Assn., Automotive Parts and Accessories Assn. and Assn. of Auto and Truck Recyclers.

"We spell everything out when we quote on a job," says Richard Kay, of Michigan Motor Exchange. Kay gives the customer a printed sheet listing the parts to be used and whether they are new or rebuilt.

Even the reputable shops that give written guarantees with their work usually break the guarantee down into two parts. The engine itself and materials used in it are guaranteed for 12 months or 12,000 miles. But the guarantee on labor is usually good for only 90 days or 4000 miles. The thinking on this is that if an engine is put together right, any problem that is the responsibility of the mechanic will show up within three months. After 90 days or 4000 miles, an engine can develop problems through normal wear and use; the mechanic should not be blamed for difficulties resulting from wear.

Suppose you have a car you really like and it's in good shape except for the engine. The engine is one of those gas-guzzling V8s Detroit turned out by the millions before the fuel shortage. Can you replace the gas hog with a small Six?

The answer is yes. But a qualified yes.

To pull a V8 and replace it with a Six, you're talking big money. Not less than \$1000 and possibly \$1200 to \$1300. Many engine-related parts on an Eight can't be adapted to a Six. Although the original equipment fittings and parts may have thousands of miles left on them, they can't be connected up to a Six. They have to be scrapped for new hardware that can be mated with a Six, and that runs up the price.

If what you want out of a car is transportation, miles of use, and if you don't mind being a few years out of step on styling, a replacement engine is a good way to go. New car or replacement engine, you are buying about 150,000 miles of there-and-back. You get a lot more miles for the buck with a new engine than with a new car. ★ ★ ★



Massive Aquapolis, shown under construction in Hiroshima, provides ample room for 2400 visitors and a crew of 195. Its cost will top \$35 million.

Aquapolis: City in the sea

by Bob Berger

That iron monster of the sea, the semisubmersible drilling rig, has come into its own as the search for offshore oil intensifies in many corners of the world. A number of nations build the huge platforms, but Japan is the first to use the basic design to create something that is completely different—a floating tourist attraction.

Called "Aquapolis," the semisubmersible will be the Japanese government's star attraction at International Ocean Expo '75, an exhibition devoted to increasing our awareness of the ocean's importance to life. Japanese officials regard Aquapolis as a prototype of the self-contained marine community of the future.

Site of the exposition will be the island of Okinawa, a subtropical spit of land familiar to some veterans of World War II. Expo will run from July, 1975, to January, 1976.

Like its drilling-rig cousins, Aqua-

polis is big. It displaces 28,000 tons and its upper deck contains over 100,000 square feet of space—room enough for a heliport, and trees and park benches for the weary of foot. The main deck contains the central hall, reputedly the largest single room ever to put to sea.

Visitors ride escalators through some exhibits. One feature of the "sea forest" display is a tank holding billions of one-celled organisms called chlorella, which give off a green glow. They also have the peculiar ability to manufacture fresh water, a talent used as part of the project's life-support system.

At this writing, finishing touches are being put on Aquapolis at a Hiroshima shipyard. From there, it will be towed some 600 miles south to Okinawa and moored off the Motobu Peninsula. A bridge will link the floating island with the onshore segments of Expo '75.



Huge ballasted hulls, which may ride some 60 feet under water, provide great stability for the structure. Artist's concept shows how Aquapolis will be moored off one of Okinawa's beaches.

Now it's easy to make color prints at home

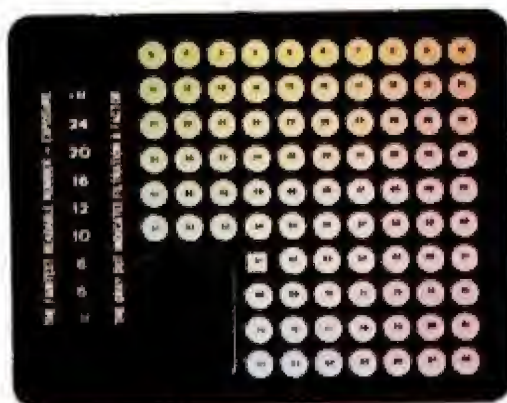
by Bob Nadler

Color printing today is not only quicker and easier than it used to be, but often even easier than black-and-white. Today, it can take as little as six to 10 minutes to process a batch of color prints—in full room light, and without getting your hands wet.

But just a few years ago, to make a Kodak color print you'd have had to spend half an hour agitating the print in trays (nine of those minutes in nearly total darkness—color-printing safelights are very, very dim), while trying to keep the temperature within half a degree of 85°



Viewing filters help you analyze printing goofs, find correct filtration. This Kodak set is \$7.



Calculators can show filtration, exposure, with one test print—for "average" negatives: Just find the gray square on the print at right and note that colors of calculator above it are reversed. Omega calculator (top) costs \$20; Beseler (shown above) is \$25, while Unicolor Unicube (above, right) is \$18.



Contact sheets indicate relative exposure and the filtration needs of all negatives on a roll.



F. (29½° C.). You could cut that time to only seven minutes (and only 2½ minutes in the dim or dark) by investing \$200 in Kodak's drum processor—but then you'd have had to hold an even higher temperature of 100° F. (38° C.) to the same half-degree accuracy.

Even after you'd finished processing your print, you still couldn't judge its color till it was dry—a problem now eased by quick-drying "RC" resin-coated papers. True, there was a paper, Agfa's, whose color could be judged when wet; but in my experience it was almost impossible to find. Today, there are several such "Type B" papers.

Since then, several new names have entered the home color darkroom field, with the result that you can now make prints in less time, at lower and less scrupulously maintained temperatures, using less chemicals and spending less on equipment than ever before—and still get better results with fewer test prints.

Perhaps the most significant of these new advances was one of the simplest: the plastic drum. It's little more than an opaque plastic tube a few inches in diameter and a bit longer than the largest sheet of paper it's designed to hold, with light-tight caps at both ends. At least one of those end caps is usually removable so a sheet of paper can be loaded into the drum, emulsion-side in. In one or both caps is a light-trapped spout so chemicals can be poured in and out.

So now all you have to do in darkness (or in the gloom of a safelight) is to remove your color paper from the box, put it in your easel, expose it under your enlarger and put it into the drum. After recapping the drum, the lights go on and you begin to process.

These drums may resemble film tanks, but they're used quite differently. Instead of filling them with chemicals and standing them on end, you pour in just a few ounces of solution, lay the drum on its side and roll it, either by hand or with a motorized agitator (one, the new Paterson, uses a crank) so that the tiny puddle of chemicals within the drum passes over and over every square inch of the paper. After each step, you simply pour out the solution, and you're ready for the next step.

The introduction of the daylight color print processing drum has almost eliminated time spent in the

dark; has helped prevent some darkroom accidents and has much reduced darkroom boredom. Because the drum uses only small quantities of chemicals, these can be discarded after use, allowing the use of fresh chemicals each time, with a resulting increase in print-to-print consistency. The drum, along with other advances in chemicals and papers, makes it possible to get a wet, but evaluable, print in just a few minutes without a real darkroom or even running water. All you need now is a dark closet for your enlarger.

But intimidating as the wet side of color printing was reputed to be, the dry side was thought even more mysterious and demanding. For years, would-be color printers have quaked in their boots at the thought of juggling colored plastic filters to get a filter pack that would produce something called a "balanced" print without the help of an electronic device called a "color analyzer," costing between \$100 and \$500. Actually, it doesn't take expensive equipment, just patience and a bit of intelligence.

To begin with, only three colors of filters are in common use, and you never use more than two at a time. Using all three adds no color to the filter pack, just a neutral density (gray) which lengthens the exposure time. These days, there are plenty of sources of clear and simple information on how to regulate the filter pack, and some positive-to-positive processes now used seldom require much pack manipulation at all, after a base pack has been determined.

Still, determining a base pack can take a lot of time using trial-and-error methods. But there are several devices to help you determine which filter pack will print which negative. The most useful, to my mind, are the inexpensive subtractive color calculators marketed by Unicolor, Beseler, Simmard and Omega—Unicolor's Unicube being perhaps the best known. To use them, you put the negative in the enlarger, slip a diffuser under your enlarger lens to homogenize all the colors together, "contact print" the calculator in the resulting scrambled light and develop. Then (following instructions which range from simple to incredibly complicated, depending on the manufacturer), you decipher the dried resulting print which is a pattern of many-colored dots to get close to the right filter pack (or close to the almost-right one, if you're really critical about your results).

Cheap to buy, calculators can be expensive to use, since they require that you make a test print for each negative you wish to find a pack for

(a series of shots on the same roll made under the same lighting conditions may require no change of pack, though).

Calculators are designed to work with "average" negatives. Unfortunately, I seldom see an "average" negative, though manufacturers claim 85 percent of all negatives fall into that category; maybe their definition of "average" is a lot broader than mine. Negatives that are a little off the average will give results a little off (perhaps acceptably so, depending on subject matter and your standards); negatives that are a lot off (warm-toned sunset shots, seascapes with a lot of blue, or any other shots with one predominant color) will give way-out results—for which returning to a normal negative filter pack will usually get you closer to the right color rendition.

Electronic analyzers, though expensive, may save money in the long run if you do a lot of printing, since they read the enlarger's light directly, without test prints. But they must be laboriously calibrated for each new package of printing paper, as well as for several additional factors. The most limited of them work

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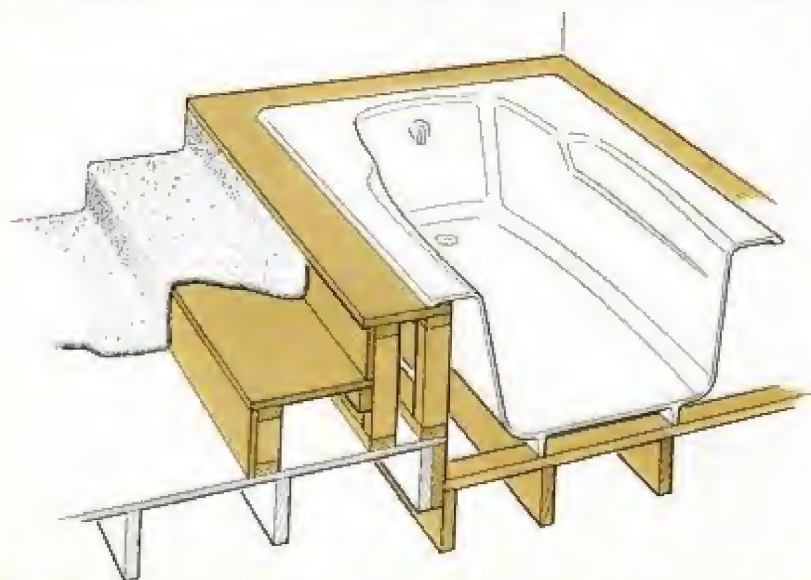
Drum processors save time and chemicals, and let you process in full room light.



How to create the illusion of a sunken tub

Tubs set in islands of shag carpet or slat-covered platforms add a bold new look to the modern bath.

by Wayne C. Leckey
HOME AND SHOP EDITOR

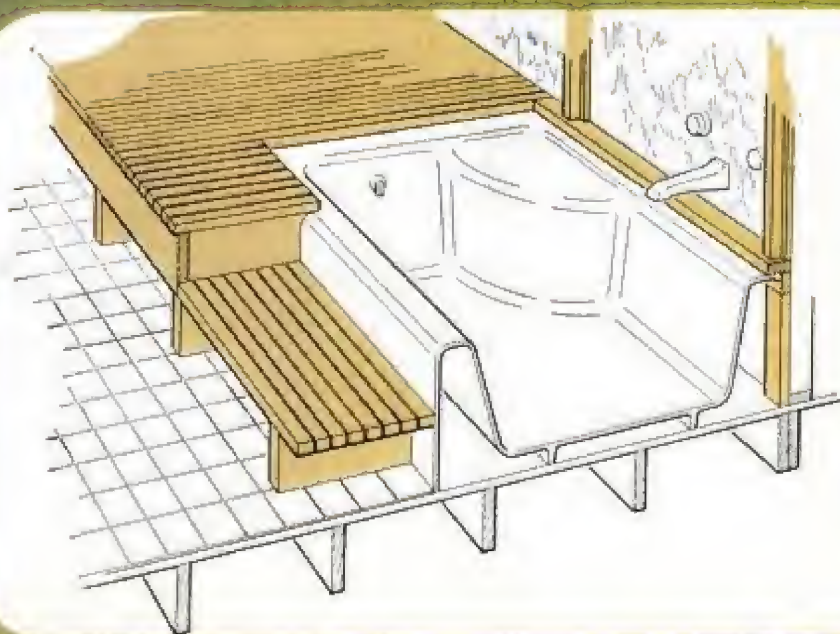


When modernizing a bathroom, you probably think you're limited to replacing old fixtures with new ones and possibly adding tile or carpeting. You're stuck with the original layout, and your new fixtures have to stay in the same old spots.

But when an adjoining room makes it possible to move a wall back a few feet, no longer are you limited to a 5 x 7-ft. floor plan. With an enlarged area, you can start thinking "sunken tub"—the latest innovation in modern bathroom planning.



A true sunken tub, of course, requires extensive structural modifications. A raised platform, however, can actually create the illusion of a sunken tub that's just as dramatic and attractive as a real one. The examples here by Kohler Co. show how a rim tub can be set in a wood-framed platform surrounded by steps and covered with shag carpet. In one (left), a 20-in.-high tub is in a well a little below floor level; in the other (above), a 14-in.-high apron tub sits on the floor and wood-slatted, split-level platforms are built around it. ★ ★ ★



IT'S NEW NOW

Father-son toolbox you can build from plans

An ideal father-son project is this classic-styled, junior-size toolbox you can make from plans for a budding young carpenter. Plans and matching father-son carpenter aprons in blue denim are \$5.95 postpaid. Plans alone, \$1.15 postpaid. Popular Mechanics, Just Like Dad's Offer, 224 West 57th St., New York, N.Y. 10019.



Kit-built trike: Added power, easier ride

New beefed-up Heald three-wheeler ATV has 10-hp, four-cycle engine, full suspension and large 12 by 21-inch tires. Super Tryke comes in semikit form, can be made street-legal with lights and other accessories. Base price with electric start is \$539.95. Heald, Inc., Box 1148, Benton Harbor, Mich. 49022.



'Convertible' biplane—open or closed

Builders of this sporty Wichawk biplane will be glad to know there's now a bubble canopy available to fit its open two-place cockpit (see *Tough Little Biplane Built for Two*, page 74, June '74). Adding or removing the canopy takes only minutes so you can enjoy your flying enclosed or exposed. For more about plans and other prefab parts, write Javelin Aircraft Co., 9175 East Douglas, Wichita, Kans. 67207.

Damageproof plastic doors

The young lady below isn't really trying to kick the door down—just demonstrating the chip and dentproof qualities of new louvered bifold doors of tough plastic. Unlike wood, they won't warp, shrink, crack or rot. Designed to circulate air in clothes, linen, utility closets, hinged panels 12, 15 and 18 inches wide come from Como Plastics, Inc., subsidiary of PPG Industries, One Gateway Center, Pittsburgh, Pa. 15222.



One-touch-control camp lantern

Latest Coleman camp lantern features double mantle for increased brightness, a single control knob for "light," "on" and "off" functions and a decorative ring of frosted bars around the globe to diffuse and soften illumination. The new Model 275-710 holds two pints, operates on white gasoline or special lantern fuels. Coleman Co., 250 North St. Francis St., Wichita, Kans. 67201.

THE LATEST PRODUCTS AND DEVELOPMENTS



TV camera goes tubeless

This TV camera has no camera tube—or any others. Instead, it uses the tiny light-sensitive, charge-coupled device shown in the model's hand. With 163,840 sensing elements, it's as sharp as some conventional TV cameras, and more than 100 times as sharp as RCA's 1972 prototype (page 102, Aug. '72). It's small, light, reliable and uses little power. Eventually, it will be economical, too—but for now, it's \$3000 to \$3800.



Boxless 'miterbox'

Stanley's new saw angle guide for straight or miter cuts positions any-size saw at angles of 45°, 60°, 75° and 90°. The tool assembles with a bolt and wingnut for left or right-handed cuts, weighs one pound, fits compactly in a toolbox. Suggested price, \$6.10. The Stanley Works, 195 Lake St., New Britain, Conn. 06050.

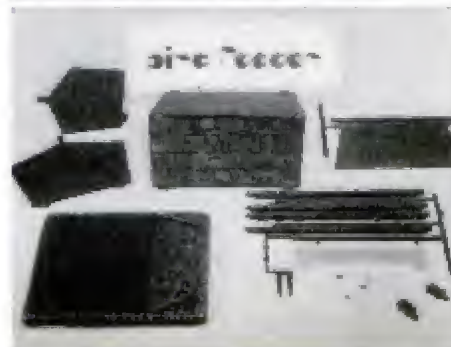
School keeps its cool—with heat from the sun

A lot is being done with solar heating these days, but this solar-cooled school in Timonium, Md., is said to be the first to use sun energy for airconditioning as well. Solar roof collectors feed heated water to an absorption-type airconditioner, which then by means of an energy-exchange process circulates chilled water through the building for cooling on hot days. AAI Corp. developed the system in conjunction with the York Div. of Borg-Warner.



Bird feeder comes in a kit

This plastic kit makes an attractive, put-it-together-yourself bird feeder that can be suspended from overhead or mounted on a pole. Its molded parts snap quickly together, and four screws complete the assembly. The feeder measures about 7 inches square and just over 4 inches high. A transparent front panel retains the seed, while a slot at the bottom releases it gradually as it's used. Lindberg Line kit, No. 323, is \$4.55 postpaid from Stock Sales Co., Box 606, Mineola, N.Y. 11501.



Portable plug-in sauna bath

You can take this portable one-man (or one-woman) sauna anywhere, plug it into a wall outlet and enjoy a refreshing sauna bath, complete with real steam and a cold shower to end up with. All you do is fill it with 1½ gallons of water; a built-in heater produces steam. After a preselected period, on comes the shower automatically. Developed in England, it's not yet on the market.

NOW



Mobile yard sprayer rolls to work

This mobile garden sprayer shoots a stream 30 feet high, can be towed by a lawn tractor for easy reaching of all yard areas. Powered by a 3-hp engine, its pump has an adjustable setting for varying pressure up to 300 p.s.i. to give a gentle spray for delicate plants or a powerful one for tall trees. Mighty Mac comes in 22 and 50-gallon tank sizes. Amerind-MacKissic, Inc., Box 111, Parker Ford, Pa. 19457.



Mini greenhouse gives garden a head start

This "garden starter" lets you begin growing flowers and vegetables up to two months ahead of normal planting time. Plastic-covered 36 by 52-inch Growing Dome assembles in minutes, is \$34.99, Arrow Group Industries, 100 Alexander Ave., Pompton Plains, N.J. 07444.

Modern architecture? No, modern hi-fi

The flat box below is Lecson's \$535 stereo preamplifier, with swank color-coded controls. Ribbed column is a \$565 100-watt-per-channel stereo amplifier. Audiophile Imports, 8 East Erie St., Chicago, Ill. 60611.



Collector's series chess set

The figures of this handsome chess set have been fashioned after the classic sculpture representative of the Roman Empire. Cast figures of set No. 135 (king 4 1/2 in. high) are heavily weighted, felted, finished in antique gold and silver, come in imitation leather chest. \$45 post-paid, Armor Co., Box 290, Deer Park, N.Y. 11729.

Tables combine country look and chrome

Accent tables in "country modern" style feature natural look with tops that simulate random planking, but are highly resistant to alcohol and stains. In either pine or white color, they have chrome-finished legs. Tables are \$24.95 and \$39.99, matching battery clock is \$39.95; at furniture, department and gift stores. Burwood Products Co., Traverse City, Mich. 49684.





'Talking book' tells stories

Young children no longer must look at picture books and just guess at what's going on. With this "talking book" invented in Germany, they actually hear a story being told as they follow the pictures. Attached to each page is a record over which is placed a player (far left). Instead of the record turning, a pickup stylus in the player revolves to follow the grooves and reproduce spoken words. Text-Ton GmbH, Box 240, 8052 Moosburg, Germany, is the maker.



New features improve FM listening, taping

For taping off the air, Pioneer's new TX-9500 AM/FM tuner (upper unit above) has a front-panel output level control and a built-in oscillator that provides a test signal for setting recording levels before a program starts. It's priced at \$400. The major feature of Kenosonic's Accuphase T-101 FM tuner (lower unit) is an IF section whose bandwidth can be changed from wide (for lowest-distortion reception) to narrow (to eliminate noise and interference). The \$450 tuner also has a separate meter for multipath interference, plus signal-strength and center-of-channel tuning meters. Like the Pioneer, it has a front-panel level control, and both tuners have phase-locked-loop multiplex sections, extra-long tuning dials, buffered tuning oscillators for greater stability, as well as multiplex filter switches.

Advent's expensive radio is cheap hi-fi

Advent's new Model 400 FM radio costs \$125. But it picks up stations as well as component tuners do, has true high-fidelity (if monophonic) sound, with bass and treble controls and a speaker you can place wherever it sounds best.



Attachment turns chain saw into lumber mill

Mini-Mill is a simple clamp-on chain-saw accessory that makes it easy to mill accurately sized lumber from logs, its maker claims. Cuts boards to any thickness from 1/2 in. to 3 1/2 in. \$49.50, at hardware, garden-supply stores or postpaid from manufacturer, Granger Industries, 200 South Garrard Blvd., Richmond, Calif. 94804.

Slip-on wheels roll your boat to water

Launching a small sailboat is an easy one-man job with these hook-on wheels. The wheels fit Sailfish-type craft and are quickly attached and removed using existing rudder fittings. Models are available for Sunfish, Minifish, Sailfish, Filte 12, Windflite 14, Butterfly, Laser and Force 5. \$24.95 postpaid, Midwest Aquatics, 6800 Telegraph, Birmingham, Mich. 48010.



NOW



It may look funny, but it's no laughing matter

Slow-moving highway-maintenance crews in Michigan take no chances of being hit by unwary speeding motorists. The last truck in each convoy trails a "crash cushion" of 34 steel barrels to absorb the impact of any rear-end collision, thus protecting both workmen and drivers alike.



Rooftop reports from weather kit

Want to know wind speed and direction, humidity and indoor and outdoor temperatures—not at some far-away weather bureau but right at your own house? Build this Heathkit home weather station, mount its weather sensors on your TV antenna mast, and you can read it all on four dials. Removable ends let dials sit upright (top) or mount flat on a wall for vertical or horizontal hanging. Kit is \$90, plus cables. Heath Co., Benton Harbor, Mich. 49022.



Easy oil changer for your car

Your own engine helps you change oil in this quick, no-mess system for draining out old oil. You simply attach a drain hose to the oil-filter port, then run the engine to pump used, dirty oil into a disposable plastic bag. Kit of parts for \$9.95 fits all American-made car and boat engines with spin-on-type oil filters. (Late-model Chevy V8s from '68 on require extra adapter for \$2.95.) Goodrich Co., 9641 Garfield Ave. South, Bloomington, Minn. 55420.



Super cooking

Super Skewer (the finned spike at left) is said to reduce cooking time of roasts up to 50 percent and meat shrinkage up to 40 percent by conducting heat directly to the center of the meat. The hollow, wick-filled tube contains a self-circulating heat-transfer liquid that works on a evaporation-condensation cycle. \$9.95 post-paid from Isothermics, Inc., Box 86, Augusta, N. J. 07822.



Add-on steps for your boat

These bolt-on aluminum transom platforms give you a handy place to stand when working on an outboard motor or stern drive, also serve as steps for swimmers, skiers and divers. Adjustable, they mount level regardless of transom angle. \$59 each, Bay Pattern Works, Box 1250, Milan, Ohio 44846.

Cable lock also triggers alarm

This antitheft device for motorcycles, snowmobiles and trailers combines locking cable, audible alarm and license-plate holder into one handy accessory. The alarm sounds if the cable is cut or the vehicle is subjected to any sudden impact. Dualock is made by Ryco, 2010 Hartog Drive, San Jose, Calif. 95131.



Fast meals for trees

Made of compacted 16-8-8 analysis fertilizer, these tree food spikes are simply driven into the ground around a tree trunk and are said to be highly effective in delivering fertilizer to roots. Box of five spikes fertilizes a 20-foot tree for a full season, sells for \$2.95. Jobe's Tree Food Spikes, 462 East High St., Lexington, Ky. 40508.



Can a good little \$125 calculator beat a \$395 one?

Remember the first pocket scientific calculator? When Hewlett-Packard introduced it three years ago at \$395. It was a sensation. Here's a \$125 Hewlett-Packard model that does everything the old one did, plus converting rectangular to polar coordinates and doing trigonometric functions in radians as well as degrees. The new model is smaller and lighter, too. Operating time on rechargeable batteries is three to five hours (recharging takes six hours); you can carry a spare battery.

Infinitely adjustable socket

Adjustable socket (below) replaces several socket sets, since it lets you dial any size—including metric—from $\frac{1}{8}$ to $1\frac{1}{2}$ inches. Fits any socket wrench. \$25.95 postpaid from Schlesinger's for Tools, Ltd., 1261 Utica Ave., Brooklyn, N.Y. 11203.



Portable slide-sound and PA systems fold to briefcase size

The names are on the cute side, but the features are even cuter in these two portable fold-up show systems from Buhl. Viewa-buhl (left, above) holds a Carousel slide projector, cassette tape recorder and Programma-buhl slide-tape synchronizer for putting on slide-sound shows on a built-in rear-projection screen. About \$280. Audi-buhl (right) is a public-address system with built-in speaker and amplifier that folds into an attache case, leaving room for speech notes. About \$150. Buhl, 60 Spruce St., Paterson, N.J. 07501.



Tapeless tape measure

Just sight through this optical "tape measure" and you can tell how far away anything is to 100 feet. Working on the same principle as a camera rangefinder, it has a dial you turn until two images merge, then distance shows up on a scale. \$24 postpaid. The Gallery, Amsterdam, N.Y. 12010.



Sculptured speaker grilles improve looks, sound

Now your old speakers can sport those fancy, sculptured-foam grilles found on many of today's new models. Though thick, the foam restricts high frequencies even less than cloth grilles. Available in 8 by 15 and 14 by 24 inches, the grilles are easily trimmed to size and attached. Republic Systems Corp., 9160 South Green St., Chicago, Ill. 60620.

Mobiles, modulars: Two ways to low-cost housing

1. The case for the modular home

Factory-built, it may be better made than an on-site construction job—and save you money as well. But there are pitfalls. Here's what you should know to shop wisely.

by David Lampe

In this time of soaring and uncertain housing costs, a house built on a factory production line may be just about your best dollar-for-dollar new home buy. This prebuilt house may arrive at your site on a truck, or it may have its own wheels and be a trailer. In the former case, it's called a modular home; in the latter, a mobile home.

While it's not possible to compare the two directly because they represent basically different concepts, it is possible to make a case for each. Both offer a way to help beat the high cost of housing, have certain advantages and disadvantages, and are sold through more or less the same kinds of dealers—some reputable, some not so reputable—so it's important to know exactly what you're getting into before considering the purchase of either type.

For this reason, PM presents here a detailed look at the modular and mobile home in two companion articles. On these pages, we'll discuss the modular home and its special peculiarities. On the following pages, we'll take up the mobile.

Of the two, the mobile is the considerably cheaper way to go, but, being a trailer, is subject to legal restrictions—you can't just park it anywhere you want. Most building codes and zoning laws prohibit its use on private residential property and restrict it to legally established "trailer parks." This is not necessarily a serious drawback—just a fact of life to be faced.

The big advantage of modular homes, also called sectionals, is that, once completed, they are virtually indistinguishable from a conventionally built home and are accepted in most communities provided their



specifications meet local building standards. They may even be better constructed than a site-built house because they're made under controlled conditions. What's more, cost savings based on a comparable site-built house—a three-bedroom ranch, say—can run as high as \$10,000.

Your modular home will probably be delivered in two halves after, of course, a suitable foundation is prepared first. The halves, carried on long flatbed trailer trucks, will then be spliced together on the foundation, built-in wiring and plumbing will be hooked up, and your new "instant house" will be ready for occupancy. If you're lucky, you may even be able to move in the same day.

But like all "almost-too-good-to-be-true" pitches, there are a lot of curves involved.

■ On the plus side:

You save money and get a house that was built truer because it was made on uniform factory jigs by production-line workers skilled in the tasks they perform. It was made indoors out of dry lumber and usually is shipped wrapped in plastic, so it will probably warp, crack and shrink less than a site-built house.

Most modulars are built to comply

"Instant house" arrives in two halves, each on a truck, can be pieced together and made livable in as little as a day.

with one or more industrywide building codes, meaning you are assured of certain basic construction standards. Thus, you may find mortgage money a bit easier to track down; bankers don't like surprises, and with a modular they at least have some idea of what they are being asked to back.

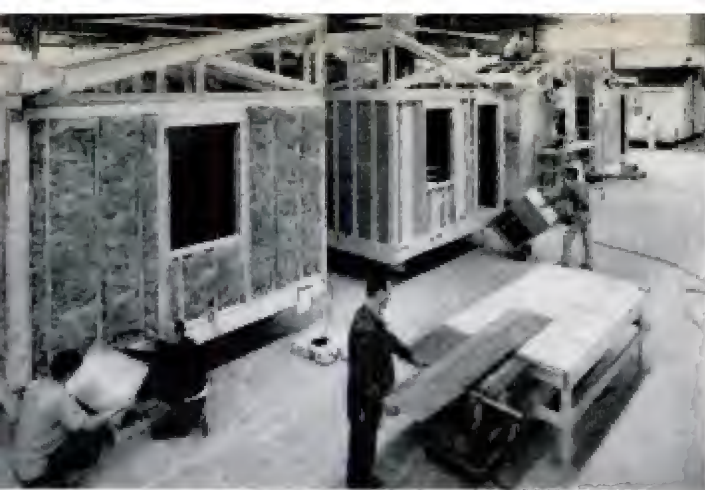
You can—in many instances—"customize" your modular. When placing your order, you can specify the relocation or elimination of room-dividing walls, say, or the addition or elimination of windows, or provision for a future fireplace. Usually, if you provide them, you can have such things as your choice of carpeting and wall covering installed at the factory.

Once your modular is lived in and your site landscaped and "aged," Sherlock Holmes would have a tough time distinguishing between it and an individually built house, a comforting thought should you ever want to sell.

■ On the minus side:

Like an assortment of chocolates,

(Please turn to page 132)



Made on precise jigs in dry, controlled facilities, factory-built home may be better constructed than many site-built houses.



Appearances can be deceiving as here. If you hadn't seen them being built, you'd be hard-pressed to tell if these two homes were trucked in or erected on the spot. Actually, both are modulars, proving such homes can look just as normal and attractive as any conventional house.

TYPICAL SIDE-BY-SIDE ARRANGEMENT OF 2 12-FT.-WIDE UNITS

STAGGERED ARRANGEMENT OF 3 12-FT.-WIDE UNITS



Modular house plans can vary considerably. While most common is two-unit side-by-side arrangement (far right), lavish layouts like one at near right are possible.



2. The case for the mobile home

Trailer parks are improving in appearance and facilities, offer low-cost living if you can put up with some limitations.

by Robert C. Reschke

About the least expensive form of new, single-family dwelling available in the United States today is the so-called mobile home—"so-called" because more than 90 percent of such homes, once set up and lived in, are never again moved. They may be bought and sold, their owners may change, but seldom are they transported to a new location. For one thing, hauling a 14-foot-wide by 70-foot-long wheeled monster over the road just isn't very practical. "Mobile" homes simply aren't really mobile—and aren't designed to be.

While somewhat looked down on in the past, mobile homes are following several new trends that make them worthy of serious consideration for inexpensive, permanent living quarters. First, the old run-down, slum-like trailer parks with their units packed tightly together row upon row are beginning to disappear. In their place are coming carefully planned, attractively landscaped mobile home "communities," with forest lands, winding rural roads, trickling brooks, flower-lined garden paths, clean surroundings and plenty of elbow room between units. Not all are like this yet, but more are appearing every day and are worth searching out.

Secondly, the homes themselves are improving greatly in appearance. Gone are the old round-cornered, aluminum-sheathed boxes with port-holes for windows. Modern mobile homes have real houselike peaked roofs, residential-type windows, shingled or wood-paneled exterior walls and lower side skirting to gracefully conceal their ancestral underpinnings. Optional add-ons such as porches, sun decks, awnings, carports and toolsheds also do much to enhance the looks and livability of such units. You aren't restricted to a single unit, either. As with modular homes (see preceding pages), you can combine two mobile units to double your living space. Imagine a structure 28 feet wide by 65 to 70 feet long. That's nearly 2000 square feet of floor space—a lot of house!

Starting as low as \$6000 for a single unit, mobile homes are attracting more and more budget-conscious buyers, particularly those retired and/or living on fixed, relatively modest incomes. Nation-



wide, the average selling price for a new mobile home is about \$8000—including appliances and furnishings. If you want to go up to \$20,000, loaded-with-extras luxury models rival in interior appearance and appointments those of lavish conventionally built custom homes. While their rooms are somewhat small, most mobile homes—even single-unit models—offer two bathrooms and up to three bedrooms, plus living, dining and kitchen facilities. That's remarkable when you consider the limited space and narrow shape of a typical unit.

Although estimates are just that—estimates—up to 10 million Americans may be living in mobile homes, with major concentrations in the Northeast, Florida and California.

Essentially, the homes are of three types—a *single living* unit, pretty much fixed in size, but generally 12 feet wide (although some are being built two feet wider in states that allow over-the-highway movement of 14-foot units); a *single-wide basic*

unit featuring some form of rectangularly expandable arrangement or add-on provision for a larger living room, extra bedroom, family room and so on; a *double-wide* unit that usually consists of two halves, shipped separately and joined together at the site to form a larger, more conventional-looking house. (The latter units are often similar to modular homes in construction and appearance and thus are sometimes called "modulars"—a possibly confusing use of the term to watch out for.)

A fourth type of mobile home, gaining in popularity, is the "tag along," a special double-wide that consists of one basic, 12-foot-wide unit 60 or 65 feet long to which can be coupled a "companion" unit perhaps 20 or 30 feet long. An attractive feature can be a complete unit of other than rectangular configuration.

Traditionally, mobile homes are sold on a fully furnished basis. For a buyer who goes along with a manufacturer's tastes, this can be a bar-

House-type roof and windows, base skirting around sides and added entry steps do much to conceal the fact that this mobile home is a trailer. Other possible touches are awnings, sun decks, carports.



Surprisingly roomy interior shown below results from joining two mobile home units side by side. Removing trailers' side walls opens up double-width area into large, comfortable living space.

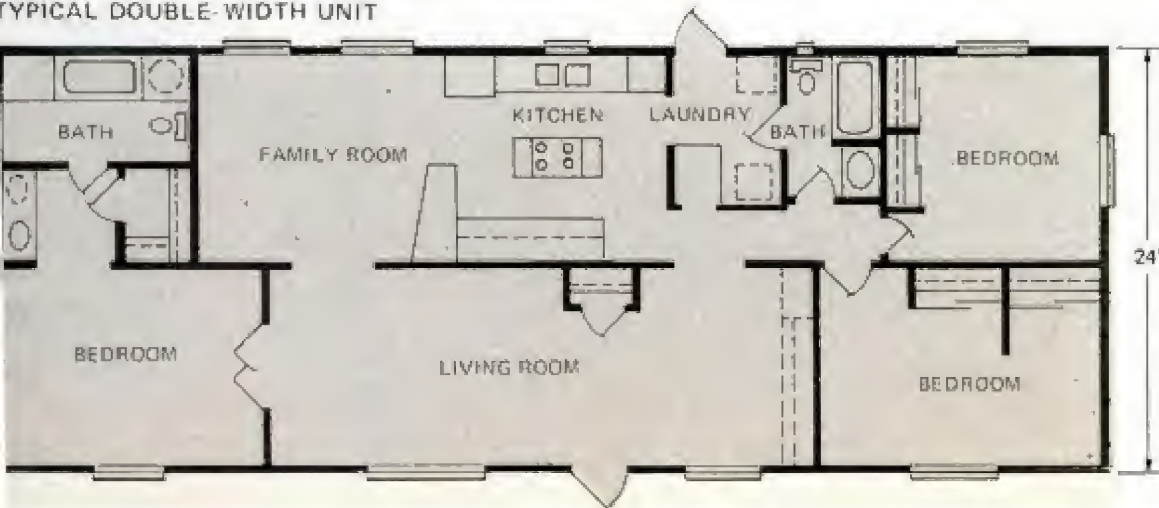


Clean, peaceful, pleasantly landscaped trailer sites like this tree-lined Timberbrook Park near Elkhart, Ind., are doing much to upgrade the image of mobile homes and make them more enjoyable to live in.

TYPICAL SINGLE-WIDTH UNIT



TYPICAL DOUBLE-WIDTH UNIT



Mobile homes give you a choice of single or double-width units. By combining two units, you can increase living quarters to as much as 28 feet wide by 70 feet long. (Width depends on width of trailer permitted by state—either 12 or 14 feet.) Note that even single unit offers two baths, three bedrooms, kitchen and living/dining area.

Pad sander know-how

by Harry Wicks
WORKSHOP EDITOR

Often called a finishing sander, this efficient power tool can save you hours of arm-wearying hand sanding.



Photos: Abe Dulberg and author

No matter what other uses you have for your pad sander—some people have been known to use the felt pad for massages—this power tool is designed basically to make finishing easier. That's why it's popularly called a finishing sander.

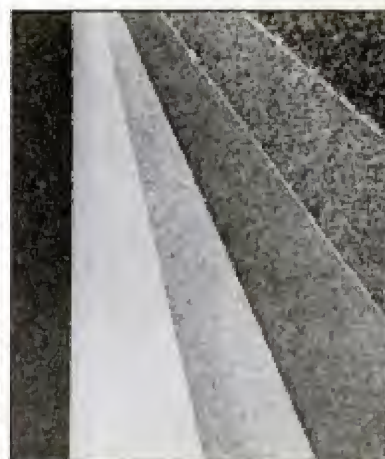
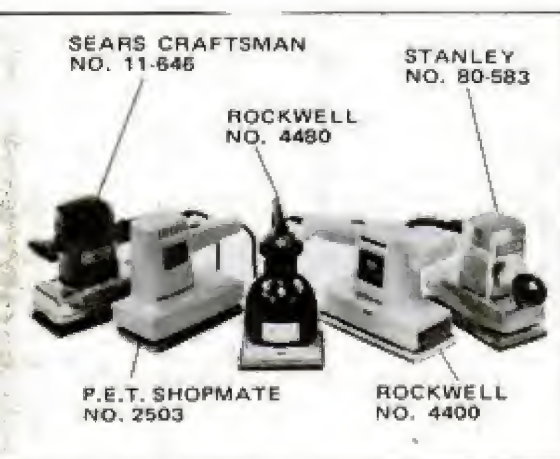
Make no mistake about it, a pad

sander is a great saver of time and effort. A project that might take hours if sanded by hand can be done in a fraction of that time with power.

Besides saving time, a power pad sander lets you do a better job. There is no way you can smooth a flat surface by hand as efficiently as

you can with abrasive paper clamped about the felt pad of a sander.

Though a finishing sander is one of the first three power tools most do-it-yourselfers buy, it is often a misused tool. It is not uncommon for a beginner (and even experienced woodworkers) to use the pad sander for jobs that would be best per-



Sanders vary in quality and cost; tools here range in price from \$20 to \$60.

Papers sized to suit various makers' sander shoes come packaged all-one-grit or with mixed grits.

Grit variety, from left—wet or dry fine, 280, 120, 100, 80 and 60.



Different manufacturers use various kinds of on-off switches. Sears model shown here has a thumb-operated slide type (inset) instead of a toggle switch.

formed by other tools such as the block plane or belt sander. In any event, remember that the tool is not designed for heavy stock removal.

Basically, the pad sander is used to finish-sand wood just prior to applying the stain and finish to a project. By changing paper (grits), the tool also can be used to smooth

paints, varnishes, lacquers and the like between coats. Finally, when fitted with a lamb's-wool pad, a pad sander can be used with polishes and paste waxes to bring furniture to a high luster.

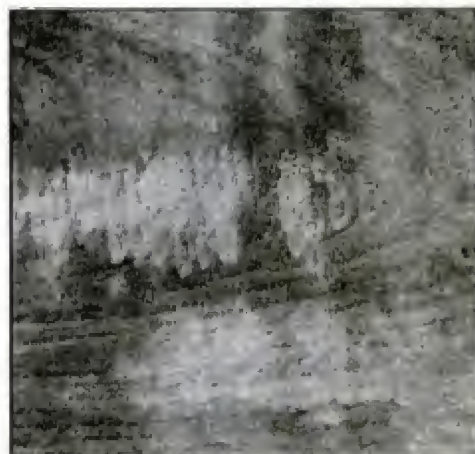
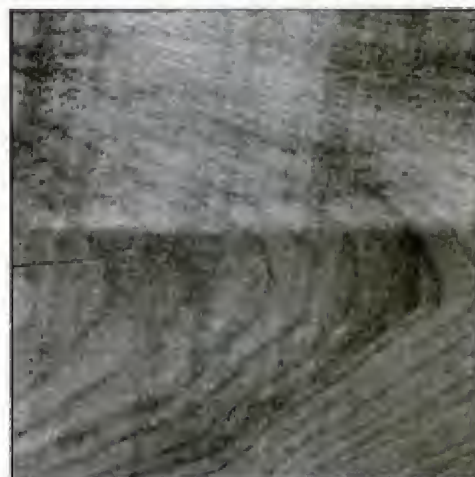
Types of pad sanders

There are two types, straight-line and orbital. The former has a back-and-forth motion which makes it ideal for with-the-grain sanding as you get close to the final stages of the sanding operation. The straight-line action removes stock more slowly than the orbital type, but does a smoother job. On some soft woods, stock removal can be speeded up by sanding across the grain in the early coarse-grit stages.

Orbital sanders, on the other hand, combine a slight side-to-side motion with back-and-forth motion to form small orbits. If speed is slow, swirls will be obvious on the finished product and mar its beauty.

Both types are readily available, and now most manufacturers offer sander models which combine both

Dual-action sanders



Two-way sander gives you a choice between straight-line (center photo) and orbital sanding (bottom). Coarse grits and birch wood were used here to illustrate patterns sander creates in both positions.



Method of holding sandpaper varies with makers; author liked Stanley's version.

actions in one tool. With these you simply select the action you want with a switch.

Choosing a pad sander

The pad sander is a simple tool—one which you can learn to use correctly in a short time. Before buying one, the smartest thing you can do is to pick up and heft the various models you are considering. The better hardware and building supply outlets usually have sample boards available for customer tool tests. You should take advantage of this service if it's available.

By doing so, you will quickly find out that some tools feel extra comfortable in your hand, while others will be just plain cumbersome. Now is the time—before spending—to find out whether or not a tool gives you satisfactory working comfort.

You will also have to decide whether you want straight-line or orbital action or both. Many craftsmen are content with an orbital sander with

a high speed and very small orbits. With one of these, it is just about impossible to see any swirl marks in the finished project unless you have super vision (or use a magnifying glass). These models also cost more than their slower, larger-orbiting cousins.

Of course, with coarse-grit paper, almost any orbital sander is certain to produce some swirl marks as shown in the photo on page 93. Here, a 40-grit paper was used on a piece of birch to demonstrate the look of sander swirls.

If you opt for a dual-action model, make certain that the switch controlling the sander action is easy to use, yet located and operated in such a way as to avoid accidental changing of sanding strokes.

As with all power tools, you get what you pay for in pad sanders. In general, it's safe to say that the higher the price, the better the quality will be: The construction of the tool plus the number and type of

bearings definitely affect the sander's price tag.

As a rule of thumb, you can figure that sanders priced under \$20 will serve just fine for the once-in-a-while user. Those equipping a wood-working shop, with the idea of doing most home handyman chores themselves and taking on occasional furniture projects, will usually be content with a tool in the \$30 to \$40 price range.

In general, pad sanders priced over \$40 are geared for the professional market. However, many serious do-it-yourselfers want the best tools; for these, sanders rated commercial or industrial are the only choices.

New on the power-tool scene and something you should think about seriously before buying, as far as I'm concerned, are the short, pigtail-like line cords which now come on many new tools—including sanders.

On these, the line cord measures a mere foot or so instead of the traditional 6 to 8 ft. The reason

(Please turn to page 137)

Typical pad-sander chores



To sand corner with minimum chatter, let side of shoe (not end) contact vertical.



Narrow surface can be accurately sanded if you work carefully and hold shoe flat.



Pad sander gets into tight corners; the orbital type usually leaves marks here.



Sand small objects by clamping sander upside down. Don't overtighten the clamp.



Fitted with a polishing pad, sander brings paste wax to smooth, high luster.



With care and fine emery paper, in a pinch, sander can be used to hone a chisel.

Scanners:

radios that stop and listen when there's something to hear

Fire and police channels aren't always busy—scanners automatically zip across the bands to the channels that are.

by Len Buckwalter



Mobile installations like this are easy with most scanners, but may be illegal some places.



Lafayette Monitorscan DB-8 covers any eight channels on high VHF or low VHF bands, has automatic scan delay (see page 97), costs \$150.



Realistic 16-channel unit covers UHF, low and high VHF, has adjustable scan rate, dual conversion, ceramic filters, is \$230.

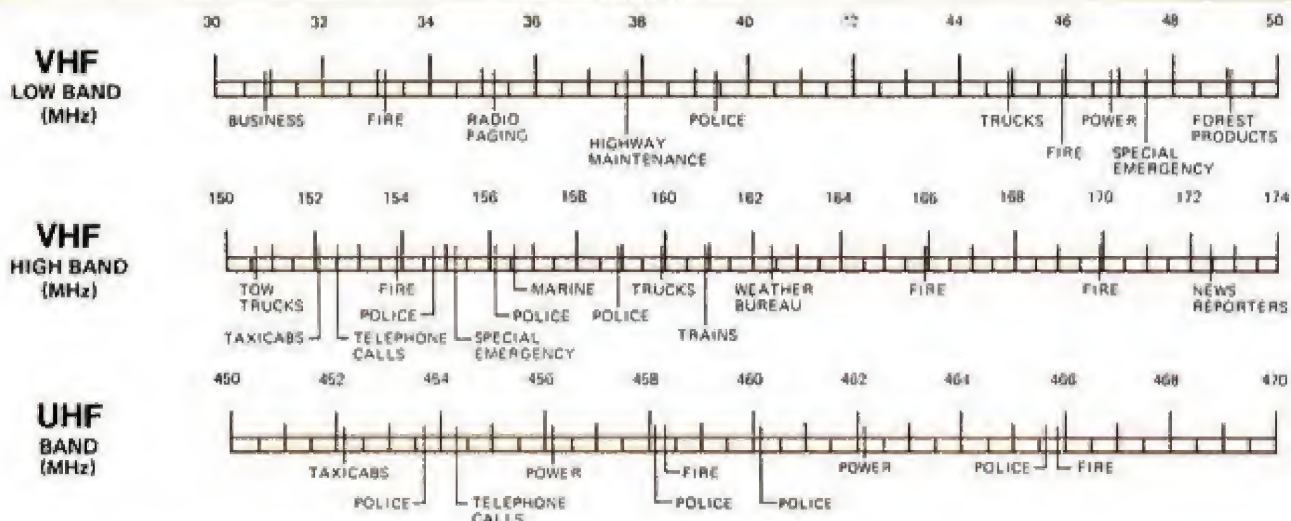


Heathkit 8-channel covers 9-MHz slice of high VHF band, has one priority channel, takes four evenings to build, is \$100.

Eavesdropping on murder, mayhem and disaster is the latest in shortwave these days. Radios to pick up police, fire and other broadcasts on the "Public Safety" bands aren't just aimed at the electronic hobbyist any more—today they're offered even by such giant retailers as J.C. Penney, Sears and Wards. You may even have seen TV commercials for public-safety radios—sure signs that they've arrived.

One-way radios to listen in on two-way communications aren't new. Multiband receivers with one or two public safety bands in addition to the standard AM and FM have been around for a decade. Boat owners especially buy them to hear the National Weather Service's continuous VHF marine forecasts. If the listener explores the band, he'll also pick up occasional police calls, marine signals, fire alarms or other bits of real-life dramas.

Multibanders with standard, continuous-



Emergency communication bands include low and high VHF, and UHF (above).

National 10 Codes:

Police and other emergency services often use these number codes to keep transmissions short. But there are variations from city to city—in New York, for example, "10-13" means "officer needs assistance."

10-0	Caution	10-49	Traffic light out
10-1	Unable to copy—change location	10-50	Accident—PI, PD, F
10-2	Signal good	10-51	Wracker needed
10-3	Stop transmitting	10-52	Ambulance needed
10-4	Acknowledgement	10-53	Road blocked
10-5	Relay	10-54	Livestock on highway
10-6	Busy—stand by unless urgent	10-55	Intoxicated driver
10-7	Out of service (give location and telephone number)	10-56	Intoxicated pedestrian
10-8	In service	10-57	Hit and run—(PD, PI, F)
10-9	Repeat	10-58	Direct traffic
10-10	Fight in progress	10-59	Convoy or escort
10-11	Dog case (specify)	10-60	Squad in vicinity
10-12	Standby (stop)	10-61	Personnel in area
10-13	Weather and road report	10-62	Reply to message
10-14	Report of prowler	10-63	Prepare to make written copy
10-15	Civil disturbance	10-64	Message for local delivery
10-16	Domestic trouble	10-65	Net message assignment
10-17	Meet complainant	10-66	Message cancellation
10-18	Complete assignment quickly	10-67	Clear to read net message
10-19	Return to _____	10-68	Dispatch information
10-20	Location	10-69	Message received
10-21	Call _____ by telephone	10-70	Fire alarm
10-22	Disregard	10-71	Advise nature of fire (Size, type, etc.)
10-23	Arrived at scene	10-72	Report progress of fire
10-24	Assignment completed	10-73	Smoke report
10-25	Report in person to _____	10-74	Negative
10-26	Detaining subject—expedite	10-75	In contact with _____
10-27	Drivers license information (MCF)	10-76	En route
10-28	Vehicle registration information	10-77	ETA (Estimated time of arrival)
10-29	Check records for wanted	10-78	*Lead assistance
10-30	Illegal use of radio	10-79	Notify coroner
10-31	Crime in progress	10-80	Chase in progress
10-32	Man with a gun	10-81	Breathalyzer report
10-33	Emergency	10-82	Reserve lodging
10-34	Riot	10-83	Work school Xing at _____
10-35	Major crime alert	10-84	If meeting _____ advise ETA
10-36	Correct time	10-85	Delayed due to _____
10-37	Investigate suspicious vehicle	10-86	Officer/operator on duty
10-38	Stopping suspicious vehicle (Give complete description before stop)	10-87	Pick up checks for distribution
10-39	Urgent—use red light and siren	10-88	Advise present telephone Number of _____
10-40	Silent run—no light or siren	10-89	Bomb threat
10-41	Beginning tour of duty	10-90	Bank alarm at _____
10-42	Ending tour of duty	10-91	Pick up personnel, prisoners, or property
10-43	Information	10-92	Improperly parked vehicle
10-44	Request permission to leave patrol for _____	10-93	Blockade
10-45	Animal carcass in _____ lane at _____	10-94	Drag racing
10-46	Assist motorist	10-95	Prisoners, subjects, or property in custody
10-47	Emergency road repairs needed	10-96	Mental subject
10-48	Traffic standard needs repairs	10-97	Check (test signal)
		10-98	Prison or jail break
		10-99	Records indicate wanted or stolen

tuning dials, though, are only useful for the most casual monitoring. That's because emergency channels—even in major cities like Los Angeles or New York—aren't always "on" the way the entertainment radio channels are. So, with continuous-dial radios, you run the risk of staying tuned to a police channel that's temporarily silent, while the fire department is yelling for more engines just a dial-twirl away. But try tuning from one active channel to another, and all you'll get are a very tired wrist and fingers.

That's where scanners come in: They search out, latch onto and deliver the action as it happens—far faster and more accurately than you can do by hand. A set equipped to scan eight local channels can check out each one about twice each second. It's all silent, but the action's visible as a spot of light that flashes across the front panel, briefly illuminating each channel's control button as it's scanned.

Johnson Duo-Scan covers eight channels on either low and high VHF or high VHF and UHF, costs \$130-\$180, according to bands.



But let one channel crackle to life with a voice, and the scanning light freezes on that channel as you hear the voice through your speaker. When the message ends and the channel falls silent again, the spot of light hurtles across the panel hunting more activity.

Channels you hear needn't be limited to police and fire calls. Sprinkled in are ambulances, marine, highway maintenance, motion picture crews, aircraft and the news media. By choosing appropriate crystals—plug-in devices that tune the receiver to an exact frequency—you can scan a mixture of services. Crystals, incidentally, are not included with a scanner because there are some 18,000 possibilities! Your dealer will know the exact frequencies you need in your area, or he can look them up in a directory.

But before shopping for a radio, it's a good idea to know something about the public service bands themselves. Equipment now available may cover from one to four bands: low VHF, high VHF, UHF, or Aviation.

Low VHF, running from 30 to 50 MHz, is the oldest band, now mostly used in smaller towns and rural areas. As two-way radio grew rapidly after World War II, congestion on this low band led to . . .

High VHF, running from 150-174 MHz. This is the major monitoring band, supplying police, fire and other public-safety channels for larger metropolitan areas, as well as the new marine VHF band for both pleasure and commercial boats. But pressure for still more channels led to the opening of . . .

UHF, running from 450-470 MHz on much present equipment, but recently extended out to 512 MHz (gobbling up some vacant UHF TV channels in the process).

Aviation frequencies from 108 to 136 MHz are only occasionally covered by scanners, though they're

common in continuously tuned multi-band radios.

In choosing a scanner, the most important points to check are its channel and band capacities. But don't confuse the two: A two-band set rated for eight channels has eight individual frequencies on either of two bands. More expensive equipment may have 16 channels that you can split among two or three bands.

Some listeners find public-service chatter fascinating—to others it's a massive bore. Spend some time listening at a dealer's or friend's to tell if you want a scanner.

If you do, and your pocketbook can stand it, choose a scanner with more channels than you think you need today. New service channels and stations keep increasing. You'll still buy only the crystals you need now (at about \$5 each), but you'll be able to add more as you need them. If there are already many active channels in your area, you might consider a scanner with, say, 32-channel *capability*: Such a set will only scan 16 channels, but lets you load 32 crystals; when you're tired of listening to one channel, you can then just switch in a reserve crystal, instead of having to open the cabinet and replace the old crystal.

Even if you've operated conventional shortwave sets, scanner controls, features and specifications may be unfamiliar. Here are some of the most important:

Programming. All scanners can be set up to sweep every channel automatically up to their full capacity. Sometimes, though, you might want to eliminate certain channels during the scan. For this reason, each channel has a lock-out switch to cause the scanner to "flash past" these frequencies. Or, you can use the switches to stop the scanning action and manually select any channel.

Squelch. This keeps noise and

annoying static from reaching the loudspeaker when no signals are being received.

Display. Most scanners show which channel is being scanned by flashing a light, but some have digital readouts that show in a window.

Carrier delay. With this common circuit, the receiver won't start scanning again until about two seconds after a message ends. This lets you hear a possible reply from another station on the channel. Otherwise, the scanner might fly on to an unrelated signal.

Priority. Your occupation or special interest may make one channel more important than the others. A boat owner, for example, might be most interested in the marine distress channel, while a volunteer fireman would want to hear his local fire company in preference to other signals. A priority circuit automatically locks the receiver to that channel whenever it is on the air. Every other station is excluded until the priority transmission is over. Some sets exercise priority for any crystal plugged into the No. 1 position; others do it for crystals both in the 1 and 8 positions.

Variable scanning. A typical scanning rate is about 15 channels per second, but some receivers let the listener vary the rate between 2 and 50 channels per second.

Channel separation. This figure, stated by the manufacturer, tells the span of frequencies a scanner can cover without losing sensitivity;

(Please turn to page 138)

Gladding Cherokee 8+8 has dual conversion, one priority channel, covers eight low and high VHF channels.



Hand-held models usually cover just four channels, 1 band. This Regency is \$120.



by Mort Schultz

Every two years you should give your car a major cooling system check. Before you start this presumer servicing, get a can of radiator flush, a can of antirust and water-pump lubricant and ethylene glycol antifreeze—the amount determined by the lowest anticipated temperature of the area and the capacity of your car's cooling system.

Regardless of climate or whether protection is thought to be needed, you should have a minimum solution of water and ethylene glycol in the



Check your cooling system...NOW!

cooling system for protection to 0° F. This guards the system against corrosion and coolant boiling.

Hoses first

With your engine cold, inspect all hoses for cracking, rotting and extreme weather checking (tiny cracks). Include the upper radiator hose, lower radiator hose, water pump bypass hose if one is there, and heater hoses.

Squeeze each hose, feeling for extreme softness. By its nature, a radiator hose that has been in use will be soft, but this doesn't mean it is rotting internally. A defective hose is one that feels really "mushy."

How to replace hoses

1. The engine should be cool. Remove the radiator cap. Drain the radiator by opening the petcock on the bottom or side of the radiator. Catch the coolant in suitable containers.

2. If you are replacing an upper radiator hose only, you need drain only the radiator. If replacing other hoses (or draining the system for flushing), you must remove cylinder-block drain plugs.

Some drain plugs incorporate the cooling-system temperature sending unit or sensor devices that are part of exhaust emissions systems. Do not remove one of these. Instead, you can complete draining by disconnect-

ing the lower radiator hose at the radiator, bending the hose down to acts as a nozzle, and letting coolant drain from the cylinder block.

3. When all coolant has drained, replace drain plug(s) and close the petcock. Loosen clamps at each end of the bad hose (usually done with a socket wrench) and slide them back. But if they freeze, cut clamps off with wirecutters or tinsnips.

4. Twist hose back and forth to break it loose; then slide it off its connections. If it's stubborn, cut it off with a sharp knife.

5. Clean all foreign matter from hose connections with a wire brush or scraper. Place clamps a minimum of 1/8-inch from each end of the new hose. Coat hose connections with a water-resistant radiator hose and gasket sealer you can buy from an auto-supply house. Slide hose firmly onto its connections.

6. See that clamps go beyond connections' beads and are positioned in the center of the clamping surface. Clamps must not be placed at the very end of the hose. Don't over-tighten the clamps.

Flushing the system

Now that the hoses are reconnected, go to the next operation—flushing. To flush a cooling system chemically, after draining, fill the radiator with water and pour in

radiator flush. Follow instructions on the can. Most chemical flushes call for running the engine for 15 minutes to one-half hour. This time can often be reduced by driving the car rather than letting it idle.

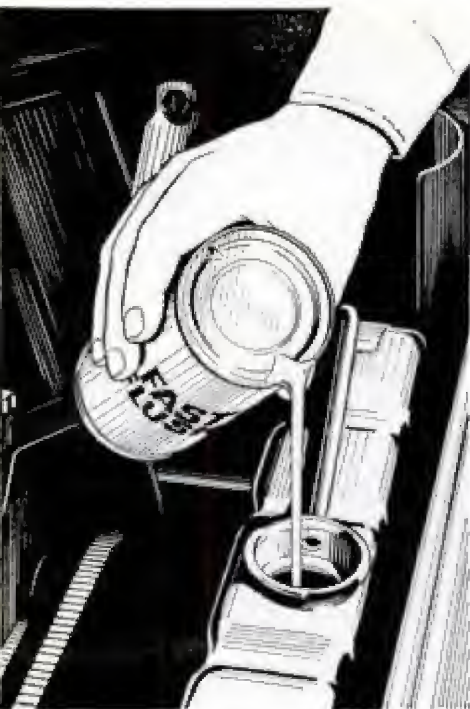
Flush the system again. If the draining fluid is sludgy after all fluid has drained, reinstall the drain plug(s), but leave the radiator petcock open. Remove the thermostat, place a garden hose in the radiator filler neck and turn it on to get a good flow of water into the radiator. Start the engine and let it run for a few minutes as the water flushes out particles.

Removing the thermostat

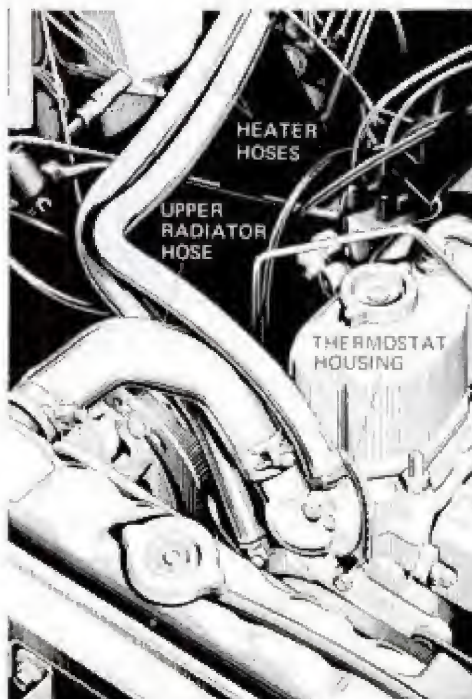
The thermostat in most cars is in the upper end of the top radiator hose. To remove it, take off the radiator cap (engine cold) and remove the bolts attaching the thermostat housing to the engine. Pull the housing off the engine, and remove the thermostat and gasket.

When you reinstall the thermostat, clean housing and engine gasket surface with a clean rag. If old gasket material sticks to either surface, scrap it off with a putty knife.

You will probably have to use a new gasket. Coat it with the same sealer you used for hose connections. In placing the thermostat back into the engine, make sure it goes in the



Cooling system flushing is a job that should be done every two years. You can use a chemical fast flush or garden-hose attachments that let you backflush the system to give it a most efficient cleaning.



Cooling system hoses are easy to locate in the engine compartment. Heater hoses run back to the firewall and through to the car heater in the passenger compartment. Check condition of all hoses periodically.

right way. Examine it for a stamping that tells you which end goes toward the radiator.

With hoses okay and cooling system flushed, close all drain points and pour in your antifreeze mixture until the level comes to within 1½ to 2 inches of the bottom of the filler neck or to the cold-fill line that may be cast into the side of the radiator or to whatever spec is provided. Now pour in a can of rust inhibitor and water-pump lubricant.

As a last step, clean debris from the radiator fins. Use a soft-bristled brush.

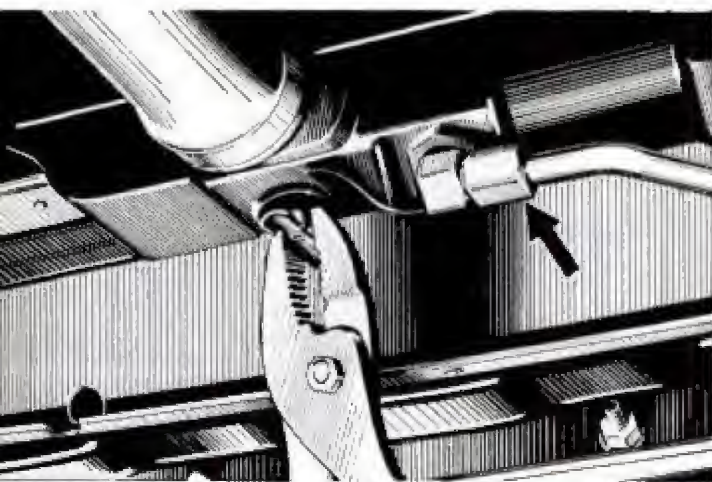
Every day for a few days, check the coolant level with the engine cold to make sure there's no leak.

Don't forget drive belts

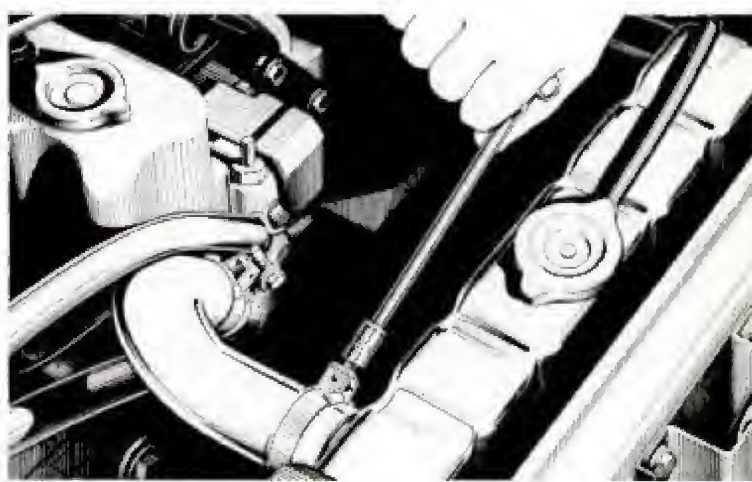
Finally, check drive belts. Press in on a belt midway between its pulleys. It should "give" no more than ½ inch.

Generally, a drive belt is adjusted by loosening the alternator mounting and adjusting bracket-arm bolts and applying pressure on the alternator housing. If you use a pry bar, place it on the front half of the alternator housing—never on the rear where electrical components are located.

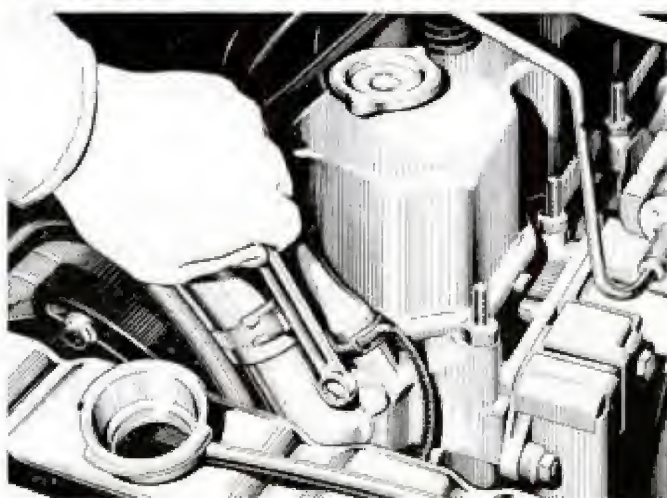
When tension is correct, tighten bolts firmly. ★★★



Open and close petcock on bottom of radiator with pliers; don't force. Drain system through bottom radiator hose rather than cause damage by forcing a frozen petcock. Arrow points to connection that's found on some cars; line goes to automatic transmission for cooling fluid.



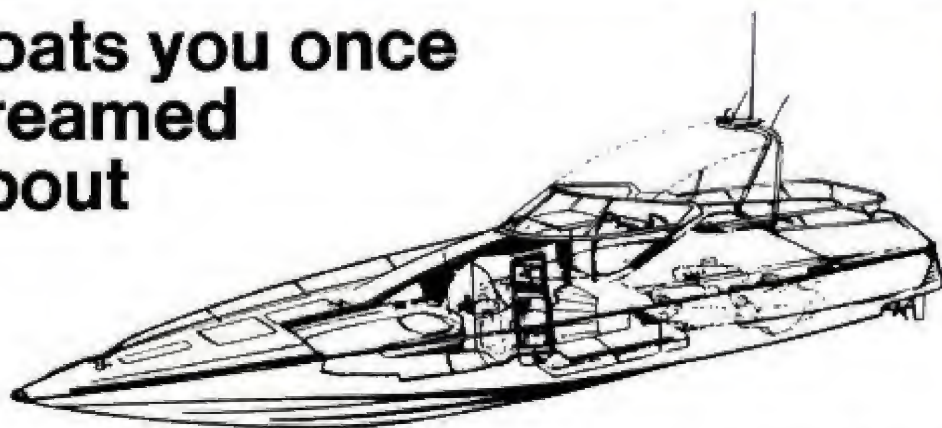
Hose-clamp bolts are slotted for screwdrivers, but a socket wrench is the best tool to use for loosening and tightening. Install hose clamps as shown—not at end of hose.



Removal of thermostat should not be done without having a spare thermostat-housing gasket on hand. Almost always a gasket will have deteriorated and need replacing.



Boats you once dreamed about



Remember the boats you designed as a boy in the back of a homework notebook—those streamlined speedsters that looked part plane, torpedo, rocketship? You were going to build one once you got to be a millionaire.

Now they are being built in Italy and imported to America by the Riva Div. of the Whittaker Marine Group in Miami, and to buy one it does help to be a millionaire. Sizes now range up from their famous runabouts to a 70-mph 37-foot overnighter and the Superamerica 42-foot cruiser that does 35 mph, and looks it.—*Bill McKeown*

Rakish runabout with 1000 hp from three engines, Riva 2000 (above and at right) was designed by famous offshore racer Renato (Sonny) Levi. With bar and shower both in cockpit and below in the cabin down circular staircase, it is \$93,000.



Superamerica, new 42-foot Cantieri Riva cruiser, can sleep seven in her deep-V fiberglass hull, is twin-diesel-powered and only about \$200,000.



Famous for fun along the French and Italian rivieras, the Riva runabouts, with sunken sun deck and reverse transom, are finished in varnished mahogany.

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Make this colonial cupboard to display your best china

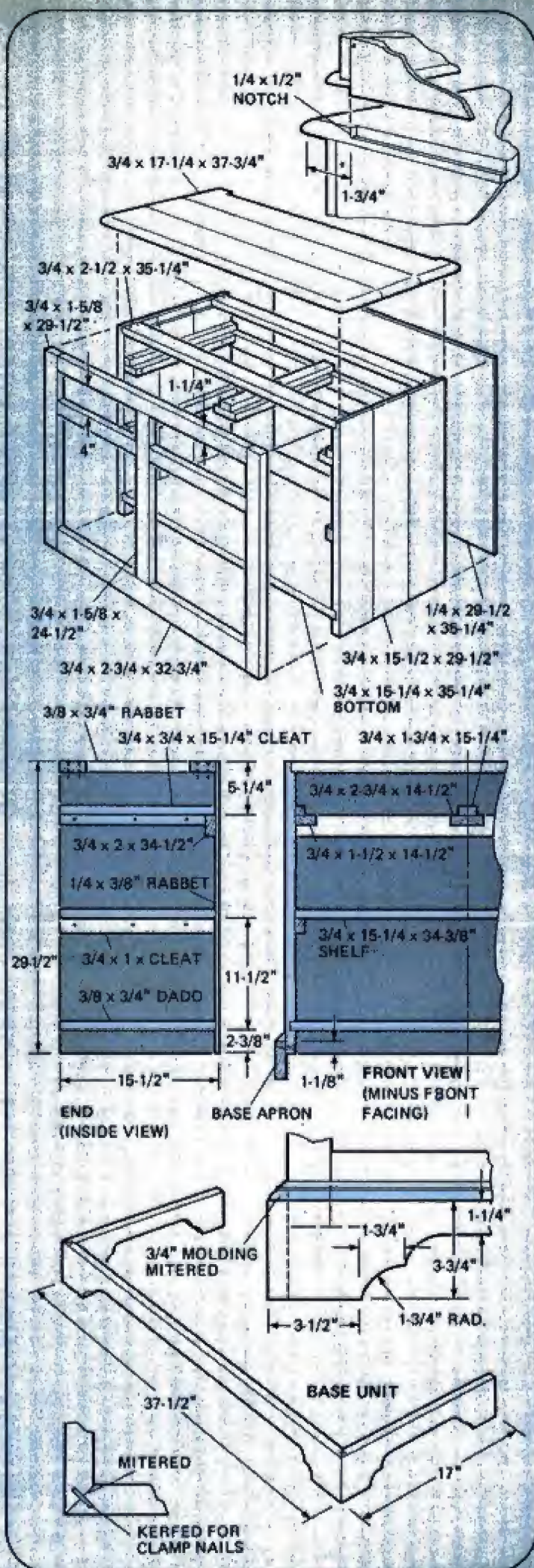
by Wayne C. Leckey
HOME AND SHOP EDITOR

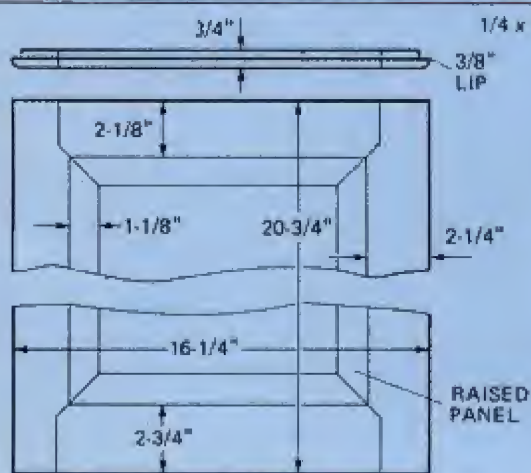
Charming, colorful and Early American in appearance, this fine version of a colonial cupboard offers the perfect setting for displaying your best china. It's made of clear pine, a wood that's easy to get at any lumberyard. The piece consists of two basic units, a base and a top, built separately.

The solid-pine ends and top for the base unit require wide pieces which must be built up of two or more boards. You can join them by simply butt-gluing the edges, but $\frac{3}{8}$ -in. dowels make the strongest joints. After sanding smooth, cut the ends to the sizes given, then run dadoes on the inside $2\frac{3}{8}$ in. up from the bottom and rabbets in the top and rear edges; the rear ones are for a $\frac{1}{4}$ -in. plywood back. You can use fir plywood for the bottom if you wish, which will save gluing-up boards. Use glue alone to hold the bottom in the dadoes and nails plus glue to attach the $2\frac{1}{2}$ -in. cross rails in the rabbets at the top. Check the assembly with a square and hold it with a diagonal brace across the front while you cut and add the plywood back.

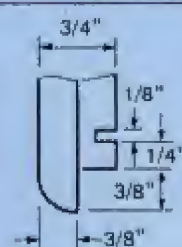
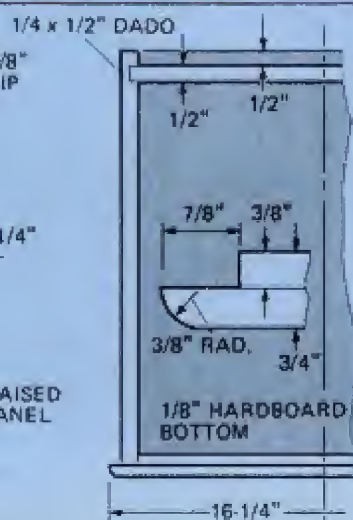
Round edges of the top along three sides with a portable router or hand plane and run a rabbet in the rear edge as shown to later receive the back panel of the upper unit. Use No. 8 x $1\frac{1}{4}$ -in. flathead screws up through the front and back cross rails to attach the top, but add the top last as this will make it easier to reach in and install the drawer guides.

Front edges of the cabinet are covered with a $\frac{3}{4}$ -in.-thick frame. Clamp it together as a

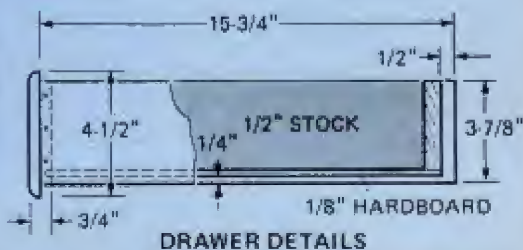




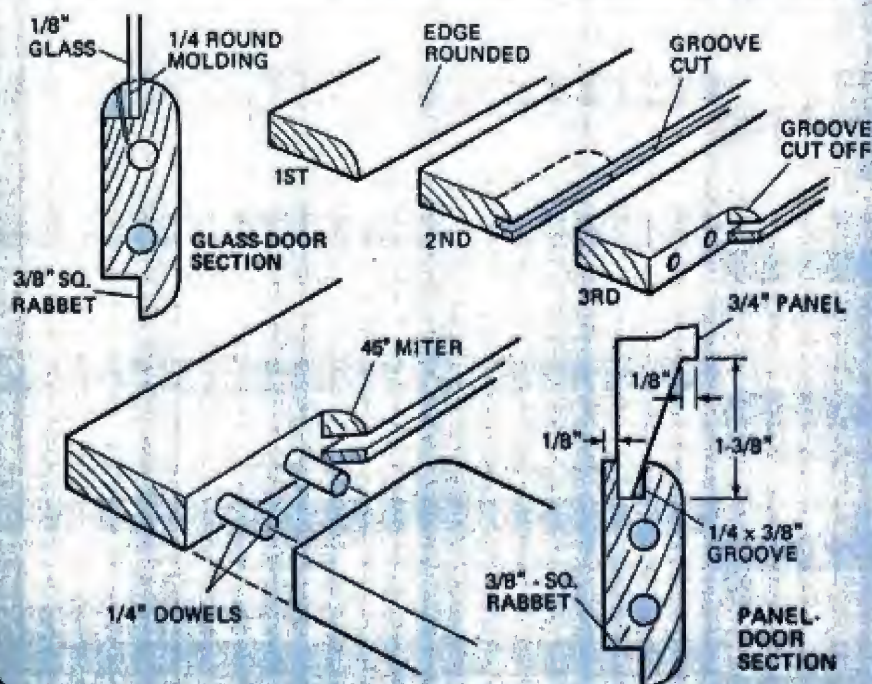
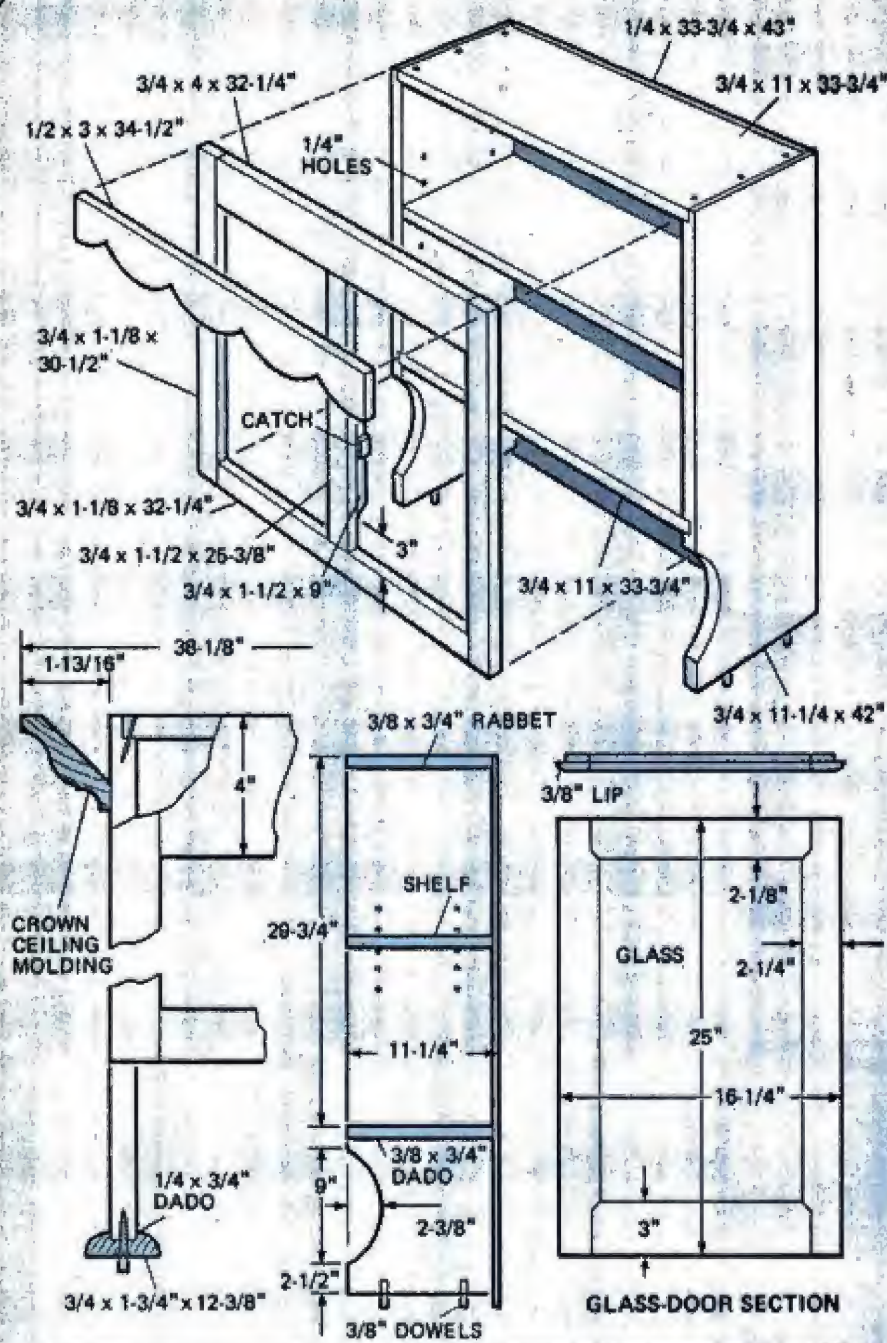
RAISED PANEL-DOOR SECTION



Drawer sides are nailed to fronts in deep and rabbets. Drawer bottoms rest in grooves cut in fronts and side members. Backs fit into side dados.



DRAWER DETAILS



separate unit, using dowels and glue to join its seven members. Apply the facing so it is even with the cabinet ends and top cross rail. Use glue, clamps and finishing nails to attach it, then set and putty the heads.

Next install the drawer guides and shelf cleats following the end and front plan views. Notice that the drawer guides are supported at the back by a 2-in. cross member and placed so they will be in line and even with the drawer openings in the front frame.

The drawers have lip fronts that lap the openings. Use $3/4$ -in. pine for fronts, $1/2$ -in. for sides and backs, $1/8$ -in. hardboard for bottoms. Fronts are rabbeted $3/8$ in. top and bottom, $7/8$ in. at ends.

The three-piece mitered base laps the front and ends $1 1/8$ in. Rip it $3 3/4$ in. wide, scroll-cut it and glue and draw the mitered corners together with clamp nails. When dry, attach it from the back with No. 8 x $1 1/4$ -in. flathead screws. Finally, miter, glue and brad a molding to finish off the top edges.

The upper unit is simpler to make since the ends, top and bottom are cut from 1x12 boards. Run dados and rabbets in the end pieces as before, saw the half-moon cutouts and bore a series of $1/4$ -in. holes $1/4$ in. deep and 1 in. apart for shelf supports. Rip the top and the bottom 11 in. wide to allow for the $1/4$ -in. back which sits in a rabbet. Before gluing and nailing the two members in place, run plate grooves in the bottom shelf, one 2 in. from the back edge, another 5 in. Make similar grooves in the adjustable middle shelf. Make grooves wide and deep enough to suit your china.

A separate frame, glued and doweled together as before, covers the front edges. Glue it on and use a finishing nail here and there to help hold it. Glue a decorative facing, scroll-cut

(Please turn to page 141)



We could all use less friction.

Friction? Who needs it?
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STP Oil Treatment does something about friction by helping to protect your engine from it. Just add a can to the crankcase when the oil is changed, and the first time it's down.

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cate better than it would without STP. And a well lubricated motor is the best way to help reduce oil consumption, bearing wear and prolong engine life.

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The trick to washing a dog is to somehow keep the dog from washing you.

The trick to a Seven & Seven? That's no trick at all. Just plunk a few ice cubes in a tall glass, add a jigger of Seagram's 7, and then fill'er up with 7 Up. You can even toss in a lemon peel, just to give this old favorite a new twist.

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3 great ways with walls

Most interior walls end up being painted, papered or paneled and looking like most other walls. But there are some that refuse to be look-alikes and end up being dramatic walls to be talked about, admired and remembered. Three such walls are pictured here, accent walls that come alive with a new and unusual beauty.

Among the common building materials employed to create glamorous walls are red-cedar shingles. Used primarily for roofs and exterior walls, shingles are now being applied to interior walls to add a rich textural appeal to a room that will harmonize beautifully with most furnishings.

The rough-sawn texture of red-wood lath, applied vertically, makes another handsome and unusual wall.

Lath varies from light beige to mahogany red in bundle and produces an interesting effect when colors are intermixed as strips are applied. Unusual designs are achieved by combining vertical patterns with herringbone.

Still another dramatic and exciting wall is one that's covered with a white simulated stone called Wallsculpture. Molded in a blend of deep dimensions, chiseled shapes and textured planes, the material creates interesting shadow patterns, subtle and simple under soft lights, beautifully bold when flooded with bright lights. It's simple to apply; you just cement it in place. ★★★



Shingle Interior-Tex
4-ft. panels by Shakerstown feature self-aligning backing. You rest back of a panel on panel below, nail or staple it in place and continue application up the wall. Molding is used at the ceiling to complete the job.



Lath in lengths of 6, 8 or 12 feet is applied to wall with panel cement or colored nails. Sand lightly, then leave it natural or coat it with satin varnish.



Wallsculpture is a molded vinyl sheet by Decro-Wall; comes in 2-ft.-sq. panels you can apply to any dry, flat wall surface—even concrete and cinder block—with tubes of contact cement. The cement wipes clean with damp cloth. Four-panel pack covers 8 sq. ft.

Shoo garden pests with a new weapon: aluminum

by David Lampe



Foil is secured with soil (above). Crop (right) and larger of two oriental cabbage plants (lower photo at right) benefitted from mulching. Stunted plant, from unmulched plot, has virus disease.



At a conference of entomologists some years ago, Dr. Floyd F. Smith paid close attention when one of the speakers told the audience that aphids are attracted by the yellow paint on tractors and the center lines of highways.

The speaker was Dr. James B. Kring, a Connecticut Experiment Station entomologist. He explained how he and his colleagues had painted shallow aluminum pans yellow and set them out to attract aphids for various studies. When he collected the crop of bugs, he observed that some of the yellow pans were empty. He further observed that all the empties were located near unpainted aluminum pans that had been left on the test site unintentionally.

Kring's report fascinated Dr. Smith, a Dept. of Agriculture Research Service entomologist who was working with plant pathologists at the USDAR research center at Beltsville, Md., on the control of aphid-transmitted viruses.

"People tend to think that aphids mostly harm plants they like to eat," explains Dr. Smith. "As a matter of fact, one aphid can do more damage to plants it finds distasteful than 500 aphids can do to plants they like. The one aphid lands on a plant, bites its stem or leaf, finds the juice distasteful, then hurries to the next plant, leaving damaging viruses on each. In no time at all, entire crops are knocked out this way.

"So I decided to turn Jim Kring's experiment around, using unpainted

aluminum as an aphid repellent."

The result: a farming technique that this summer can help you grow bigger, healthier vegetables than ever before. The system has proven a success with commercial growers.

"What had repelled those aphids from Jim Kring's unpainted pans," Dr. Smith explains, "was the strong ultraviolet reflection. In the spring of 1963 I repeated Kring's experiment. In two days, more than 2000 aphids landed in my yellow pan and only 19 in the unpainted aluminum one next to it."

To test the ability of ultraviolet reflection to divert aphids from growing plants, Dr. Smith bought rolls of aluminum-faced felt (tarpaper) and spread them shiny side up along both sides of rows of young plants in an experimental garden at Beltsville.

Results were phenomenal. Although a few fairly uncommon species of aphids were attracted by the aluminum's ultraviolet radiation, an overwhelming number of others were repelled by it. And so, Dr. Smith discovered, were certain other major garden pests, among them leaf hoppers, thrips and Mexican bean beetles. Leaf miners, a menace only to commercial growers, were attracted to the ultraviolet rays, and so were honey bees, whose activity would later help pollinate the plants.

Dr. Smith's experiments indicated that, in good weather and bad, ultraviolet radiation from aluminum reflectors can keep aphids at least 30



inches away from plants. He found that effective reflectors must be at least two feet wide and be placed within six inches of the stems of plants they protect. Aphids, he noticed, will traverse narrower bands and alight on plants long enough to inject viruses before finding the ultraviolet unpleasant.

He and his associates also discovered that aluminum is a superb mulching agent, not only keeping the soil underneath it moist but also almost weed-free. Aluminum also acts as a thermal insulator, so the soil beneath it remains seven or eight degrees cooler than exposed soil.

"This makes the mulched plants come up slower," says Smith, "which is generally good. Plants that attain their first growth less quickly tend to come on stronger later on, especially when they're as virus-free as ours."

Dr. Smith also observes that

(Please turn to page 114)

Chrysler: "The Great Getaway"

Pick yourself a spot where you can forget the everyday world and leave boredom behind.

And when you go take plenty of power to get you there and back. Like this Chrysler Funster powered by the famous Chrysler 60, with exclusive Magnapower II Ignition. It's dependable. It's powerful. And it's designed simply — for ease of service. Let Chrysler take you out of the ordinary and power your Getaway with engines ranging from 3.6 to the 135. Take your choice and hang it on a Chrysler Hydro-Vee, Runabout, Cruiser, Bass Boat or Sailboat. See them at your Chrysler Crew dealers.



Two more ways to Getaway: Check your TV listing for Chrysler-sponsored "Fishin' Hole" and "Water World."

APOLLO-SOYUZ: MANNED SPACE MISSION WITH A NEW ACCENT

(Continued from page 55)

form for conducting scientific experiments.

- To pave the way for development of optimal rendezvous and docking systems for future manned spacecraft and space stations.

- To prove out techniques for crew transfers, systems of bilingual communication and intercontrol-center activities for future international space flights.

- To provide experience in developing techniques for carrying out experiments for the Space Shuttle and other future programs.

The space rescue capability of such a system would be implicit, though not an objective of this flight. The mission also could point the way to such exotic future potentials as a U.S.-Soviet space station far larger and more elaborate than Skylab, which would be resupplied by space shuttles from the Earth and from which deep space probes could be launched.

More than three years of intensive effort were required to bring the ASTP scientific détente to launch. The project's U.S. program director, Capt. Chester Lee, puts the problems into clear focus: "Tracking networks are different, spacecraft hardware is different, language differences can play an important role, communications air-to-air, air-to-ground and between control centers must be planned in great detail . . . it's much more than just blasting off and meeting another craft in space."

How have our astronauts and Russia's cosmonauts coped with these difficulties, and how do they view the upcoming mission? I've just returned from a visit to Johnson Space Center in Houston, where I discussed these matters with each member of our first crew.

The commander of Apollo is Brig. Gen. Thomas P. Stafford (USAF), a crew member on two Gemini flights that executed some of the first dockings in space, and command pilot of Apollo 10, which flew a low lunar orbit in preparation for Apollo 11's historic moon landing.

He will be accompanied by Vance D. Brand, several times an Apollo and Skylab back-up crewman who is now making his first trip into space, and Donald K. (Deke) Slayton, an old hand in the space business. Slayton will be making his first space trip, thanks to his own dogged determination. He'd been tagged to pilot Mercury 7 in 1962 but was grounded when flight medics discovered an erratic pulse following one of his runs in the human centrifuge. He

resigned his Air Force commission and spent the next decade as NASA's civilian director of Flight Crew Operations. Meantime, he fought for restoration to full flight status.

"It was a common arterial fibrillation," he says. "I'd get a pulse feeling in the throat, that's all. They say 80 percent of such cases are caused by heart disease; the other 20 percent—like mine, probably—are not."

After many visits on his own to heart experts, Slayton was provided corrective medication. Then a clean bill of health from the Mayo Clinic finally convinced the space doctors. In March '72 he went back on flight status, just in time for ASTP.

The Russians know about Deke's 10-year fight. "Whenever he makes a talk over there," says a NASA official, "he gets a standing ovation. They admire that kind of guts."

Commander of the Soviet Soyuz

Tracking networks are different, spacecraft hardware is different . . . it's much more than just blasting off and meeting another craft in space.

is Col. Aleksey A. Leonov, who co-piloted Voskhod 2 in 1965, and was the first man to "walk in space." His teammate is Valeriy N. Kubasov, who served as flight engineer on Soyuz 6 in 1969.

One of the first problems facing spacecraft engineers was the vast difference in physical systems used in Apollo and Soyuz.

The atmosphere in Apollo, Stafford explains, is "standard old oxygen" at five pounds per square inch pressure, whereas Soyuz uses a nitrogen-oxygen mixture at sea-level pressure—about 15 p.s.i. Each craft has entirely different support, communications and operating equipment. To alter either craft to accommodate the other would have meant complete redesign.

The solution was ingenious. "Designers from both countries devised a docking module interface that would accommodate both vehicles without requiring major modification of either," says Stafford. "Soyuz's big modification is the docking mechanism on the front of their orbital module."

This circular array of three flaring petals is, as Slayton puts it, "a very nice design" contrived by Soviet



Cosmonaut Valeriy N. Kubasov (left) marks food-rating chart while Vance Brand drinks orange juice. Their aim is to choose acceptable food items for the space venture.

engineers. As both craft approach, the tapered petals on the Soyuz end of the docking module will slide between similar petals on the docking end of the Soyuz spacecraft—like three ferryboats entering three slips simultaneously—guiding both ends to perfect capture. Already this "ring and petal" principle is under consideration as standard docking equipment for our Space Shuttle program.

The Apollo end of the docking module will accommodate Apollo's present "probe-and-drogue"—an entirely different system used in the lunar program for docking with the lunar module (LM).

On this mission, the docking module (instead of an LM) will be stowed in the Apollo launch vehicle's adapter section—the tapered cone of the Saturn—right behind the command service module (CSM). Once in orbit, the CSM will detach from the Saturn, turn, dock with its own probe-and-drogue end of the docking module, extract it, turn again and set off to chase the Soyuz spacecraft coasting in orbit above it.

There's a reason for this order of events. "One of the toughest things in putting the mission together," Tom Stafford observes, "was to negotiate and work out procedures. Soyuz flies by a whole series of ground control sequences; the crew is not nearly as involved as we are. We fly our spacecraft; we track manually."

Standing at a blackboard in his office at the Space Center, Vance Brand draws an ellipse within a circle. "We start here, at a much lower altitude than Soyuz, in a tighter orbit, and we're thousands of miles behind them. They're not going to do anything, basically, but stay there in orbit and wait for us. Since our orbit has a smaller radius than theirs, we're going faster over the

(Please turn to page 112)

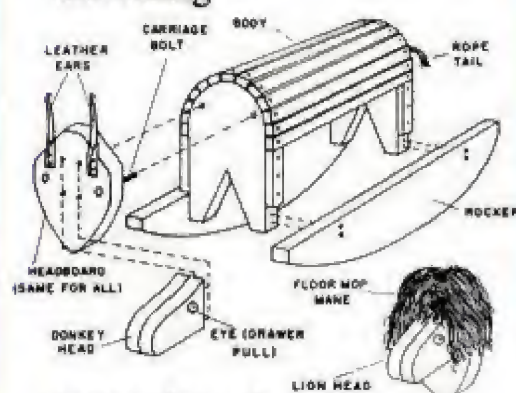
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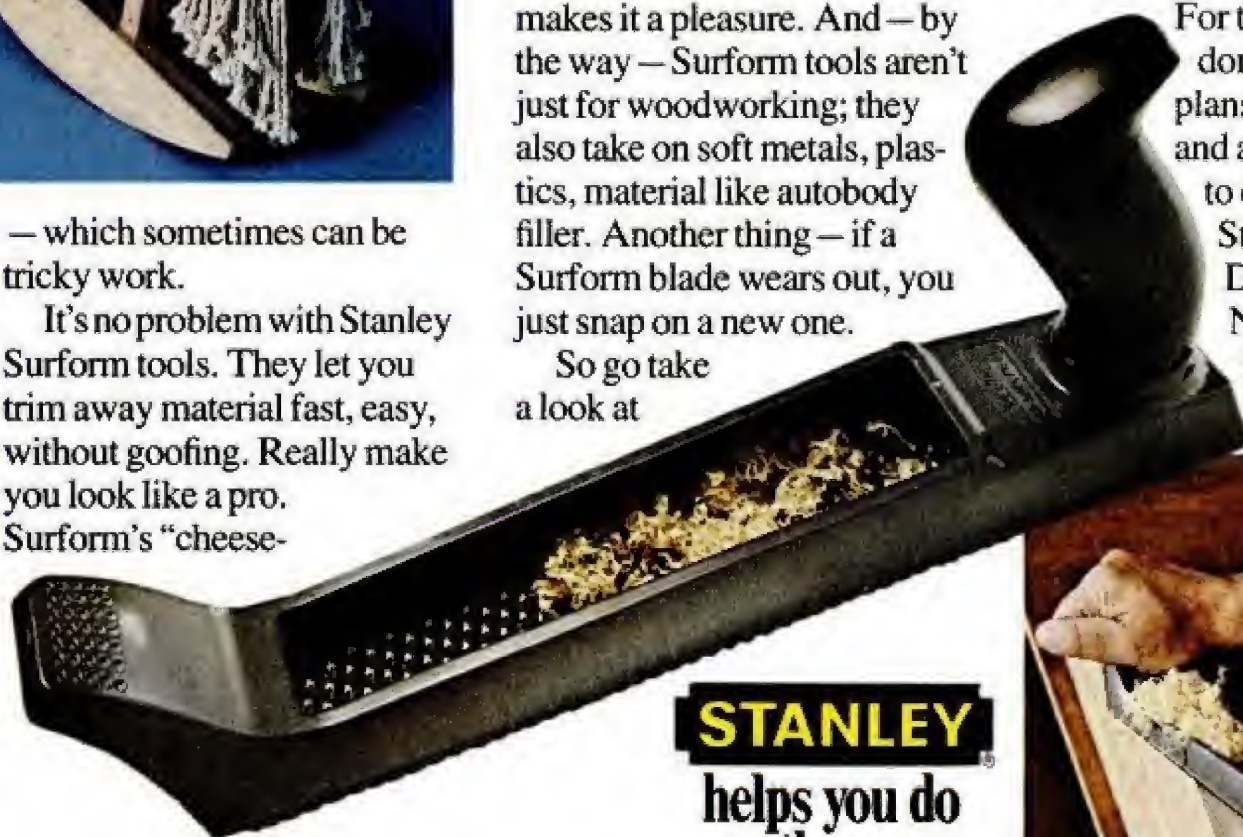


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— which sometimes can be tricky work.

It's no problem with Stanley Surform tools. They let you trim away material fast, easy, without goofing. Really make you look like a pro. Surform's "cheese-



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things
right



Earth's surface. With each orbit, we're catching up . . ."

Brand scribed a series of chalk ellipses in clockwise sequence within the circle, each larger and more circular than the one before. "... and each time around we're raising and circularizing our orbit a little more. Finally, when we get fairly close to them, we start doing burns that raise our orbit so we're approaching theirs. That slows the relative velocity between us. Once in plane—maybe several hundred miles behind them—we'll coast in to about 100 feet. Then it only takes a few minutes."

In that "few minutes" a lot happens. Tom Stafford will be doing the docking. "I'll do it manually," he says. "They'll use an automatic hold system. They'll roll to a specific attitude so we can get the high-gain antenna locked on and see our approach on TV. I have to know to the second what the time sequence is so I can coordinate manually."

During all joint maneuvers, the Americans will be speaking Russian and vice versa. "You think slower and more carefully, speak slower and more distinctly in a foreign language," Stafford explains.

Beauty of the docking module is that it will allow crews to transfer with a minimum of waiting time for adjusting to changes in pressure and atmosphere.

"While we're docked," Tom Stafford reveals, "the Russians have agreed to reduce Soyuz's pressure to 10 p.s.i. This saved us millions of dollars. Without that we'd have had men sitting in that airlock pre-breathing for two hours to avoid the bends. Now we just need to build airlock pressure to 10 pounds by adding nitrogen. Coming back, we bleed the docking module from 10 to 5 p.s.i. and add oxygen."

Plans call for 44 hours of joint activity after rendezvous and docking. The docking module, five feet in diameter and nine-and-a-half-feet long, will accommodate two men simultaneously. The schedule is arranged to give each man some time in the other craft.

Aside from the concept of joint operations in space, and testing the practicality of new space hardware to carry them out, one of the most interesting aspects of the mission will be the scientific experiments. Each country proposed some.

Deke Slayton, who has been involved in scientific logistics and problems for a decade of NASA missions in space, takes a deep interest in the experimental work.

"One category is automatic," he explains. "It's essentially a matter of putting the craft in a predetermined attitude and letting the experiment run. But in others, everyone will get involved. There's a joint microbiology experiment where we take microbe swab samples from the Russians and they take them from us—in both vehicles. Space medics will be looking for interchange of microbes in zero gravity, and maybe changes or mutations in the bugs in a space environment."

Several experiments will require careful maneuvering of both spacecraft, and precise team cooperation. In one, Apollo will undock and move out of plane until its shape blots out the disc of the sun, producing an artificial eclipse with respect to Soyuz. Characteristics of the corona will be photographed.

A series of space manufacturing experiments will be run in an electric

Theoretically, in space you can make superstrong structural materials, supermagnets and superconductor crystals. And it doesn't take much room or energy.

furnace. "Due to lack of gravity, hence lack of convection," explains Deke, "you can get homogeneous mixtures. On Earth, heavier particles settle out. Theoretically, in space you can make superstrong structural materials, supermagnets and superconductor crystals. And it doesn't take much room or energy."

"One of these years," he adds, "you'll see factories running out there."

Of all the work scheduled, Earth observations will require what Deke calls "the most man interface."

"We'll all be doing it depending on who's available over a given area. This all started back in Mercury," he adds. "Gordon Cooper came back and said he could see railroads and highways. The medics said he was out of his mind. Well, it turns out we're seeing a lot more with the old eyeball than anyone ever thought we could. We've discovered a huge dam across a big lake in South America that no one ever knew was there. Then there's that big nickel deposit in Sudbury, Canada. From the ground it's nothing, but look at it from space and it's obviously a huge meteoroid crater; a distinctive geological formation."

"I don't propose that we'll solve the world energy crisis by spotting formations, but we could make significant discoveries if we spot formations like that Sudbury crater in South America or Africa."

While none of the ASTP spacemen admit that any of the mission problems were particularly "tough," all agree that learning the opposite language and procedural systems was the "hardest training task."

Early in the joint training sessions there were some memorable language boffos. "Many Russian words look similar to ours, but watch out for syllable emphasis," Vance Brand warns. "A word that looks like *kabahl* should mean *cable*. Easy. But if you emphasize the last syllable instead of the first it means a male dog. That one got us some laughs. Then the Russians kept pronouncing maneuver 'manure' and that got them some laughs."

The joint training that brought the cosmonauts and their back-ups to Houston for lectures, and work on the Apollo simulator, also saw our ASTP astronauts—and back-ups Alan Bean, Ronald Evans and Jack Lousma—practicing on the Soyuz simulator in Star City outside Moscow. There have been seven such exchanges, plus a constant two-way stream of engineering, logistical and other space personnel.

"One thing should be made clear," says Stafford. "In all this training and observation, none of our technical secrets or know-how have been given away."

Throughout the training, spacemen of both nations established an attitude of mutual respect and friendliness. "We've gotten to know each other real well," says Brand. "One of the most interesting things was practicing transfers, with them speaking English and us Russian."

Our astronauts have practiced to proficiency the attitude control maneuvers required for braking and docking in the Soyuz simulator and are familiar with its systems. "If we ended up with mixed crews for some reason," says Brand, "there's no doubt we could re-enter safely in this mode."

The cosmonauts' view of joint training has been similarly positive. Last fall, Kubasov observed that "... relations between astronauts and cosmonauts are very friendly and warm. We not only work together but relax together perfectly well. We hope to have the same friendly relations not only before the flight but also after it." ★★



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The available sport cloth interior in classic herringbone tweed (shown above) is a no-cost option.

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Caprice Estate, part of the full line from Chevrolet, America's Family Station Wagon Builder.

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SHOO GARDEN PESTS WITH A NEW WEAPON: ALUMINUM

(Continued from page 106)

"plants are helped most by aluminum mulching during their first six to eight weeks above ground. After that those with broad foliage often completely screen the reflecting surfaces from the sunlight."

The researcher experimented with several other reflecting surfaces but found none better than aluminum foil. Aluminum paint sprayed on hardboard worked fairly well but had no special advantages.

By 1968 Dr. Smith felt he had something to tell commercial growers. As a result, two truck farmers in Cumberland County, N.J., tried aluminum mulching the next spring. The special Reynolds foil, 3/1000-inch thick and backed by thin kraft paper, cost them between \$120 and \$140 an acre and disintegrated within six to eight weeks, leaving only shreds of the inert metal to be plowed harmlessly into the soil. Planting of squash, a 42-day crop, was done through holes in the aluminum.

Their first crop was of high quality, and instead of the usual 1500 pounds per acre they reportedly harvested 8000 pounds. This big harvest would not have happened with-

out the mulching because of the intensity of aphid infestation.

The following year, 1970, about 20 Cumberland County farmers turned to aluminum mulching. One farmer who specializes in vegetables for oriental restaurants planted Chinese cabbage, a crop that in New Jersey must go into the ground in late summer, when the weather is cool enough to prevent plants from bolting (growing into stalks). But late summer is also the aphid season.

The aluminum mulch did the job. The Chinese cabbages grew splendidly and brought an exceptionally good price on the market. The results convinced other farmers of the value of the mulch.

Current work at Beltsville includes using aluminum foil to propagate young trees. As well as repelling aphids and leafhoppers, the ultraviolet reflection speeds leaf growth. Given an added boost with plant-forcing lights, their year-old trees are all as big as conventionally grown three-year-old ones.

"Normal year-old saplings sell for 15 or 20 cents," Dr. Smith says. "Our big ones are worth \$1.50 each."

Several aluminum companies are preparing special mulching foil. Whether or not your local garden center gets supplies this year, you can start using this system with materials already available—aluminum roofing, aluminum vapor barrier or aluminum paint sprayed or brushed on hardboard. For best results, put down the aluminum as soon as you've planted.

Special watering won't be necessary because tests show that aluminum-mulched fields hold 40 percent of the water beneath the mulch, and rain that falls alongside the panels will be drawn laterally beneath them. If you don't want cool soil under the aluminum at the base of your plants, try painting a strip of black paint down the edges of your panels.

It's important to remember that mulching strips must extend two feet from both sides of your rows of plants.

There are, says Dr. Smith, no negative effects of aluminum mulching. But he cautions you to wear sunglasses if you're working with the system on a bright day. The ultraviolet reflection is dazzling. ★ ★ ★

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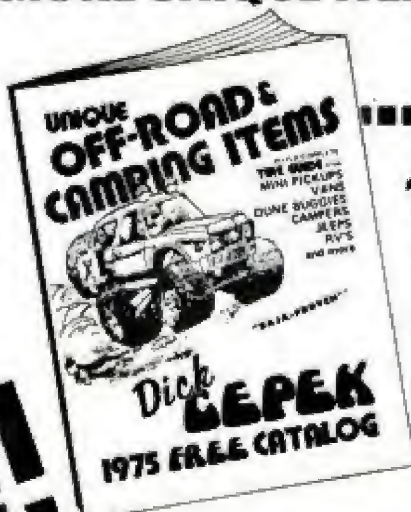
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The Evinrude 15 has a companion 9.9 hp twin — identical in size and appearance — with much of the same performance and all of the same features.

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DIVISION OF OUTBOARD MARINE CORP.
first in outboards

NIGHT-BLOOMING BEAUTY

(Continued from page 61)

be mood-lighted by directing accent lights from above or below. Use such lights in addition to soft tinted, directed or reflected lighting. Keep in mind that overall floodlighting tends to "whitewash" a garden; accent lights are your best tools for avoiding that much-dreaded look.

■ **Eliminate hazards.** Walks, steps and paths should be lighted to avoid any chance of missteps, falls and injuries. Do not use any bright or glaring fixtures on steps because they are too likely to blind step users. Ideally, fixtures for step lighting conceal all bulbs yet provide desired safety lighting. Often the locating of fixtures behind foliage will hide lamps, too.

■ **Dining out.** For patios and the like, you want lighting that will draw everyone together into a group. Try for good visibility without harsh, irritating light.

Keep in mind that you should also have some transitional lighting on the fringe area so that the change from lighted to dark areas will not be too sudden.

■ **Lawn games.** Most games can be adequately illuminated using two poles 18 to 20 ft. high with two or more 150-watt flood bulbs per pole. For net games, light poles should be about 3 ft. from each end of the net. Regardless of the game, place fixtures so light will not shine in players' eyes.

A final word. When you plan your outdoor lighting arrangement, don't overlook your neighbors' right to privacy. Aim all of the lights toward your own property—not theirs—or you will almost certainly trigger squabbles every time you turn on your lights. ★★★

CAUTION: For maximum safety, all outdoor circuits should be protected by a Ground Fault Circuit Interrupter (GFCI).

THINK SAFETY

- Work on electrical system only when the ground is dry.
- All outdoor circuits should be controlled by a switch; turn off all current while working on your outdoor system.
- Use only outdoor-type equipment with waterproof cords, plugs, sockets and connections. Buy only equipment that is UL-Listed.
- Tape temporary connections and elevate them to keep them out of puddles (because circuit must be tested before it is buried).
- If equipment comes with seals, gaskets or rubber rings, use them. These are intended to keep moisture out of sockets.
- Use only molded rubber socket for any bulb to be placed in water.

FIXTURES AND KNOW-HOW continued

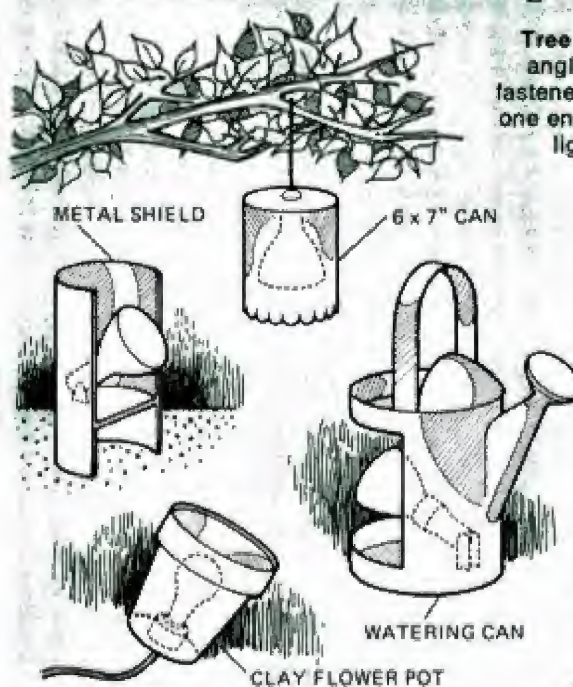
To illuminate large areas such as patio, terrace, driveway, lawn or garden, consider using fixtures suspended from tree branches. Those designed for hanging in trees are available in many shapes and sizes; bulbs ranging from 60 to 150 watts are often used to add sparkle, color and charm to above noted areas.

TREE DOWN-LIGHT FIXTURES



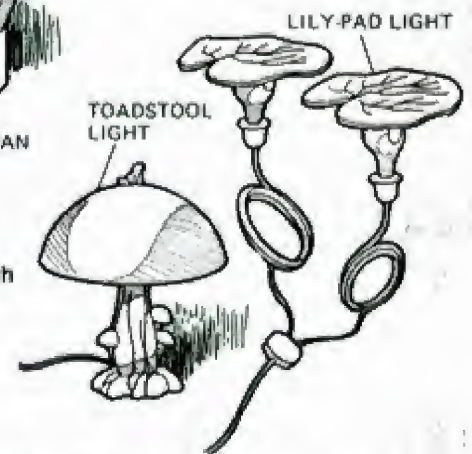
Tree light can be angled with wire fastened to limb on one end, bottom of light on other.

DO-IT-YOURSELF FIXTURES

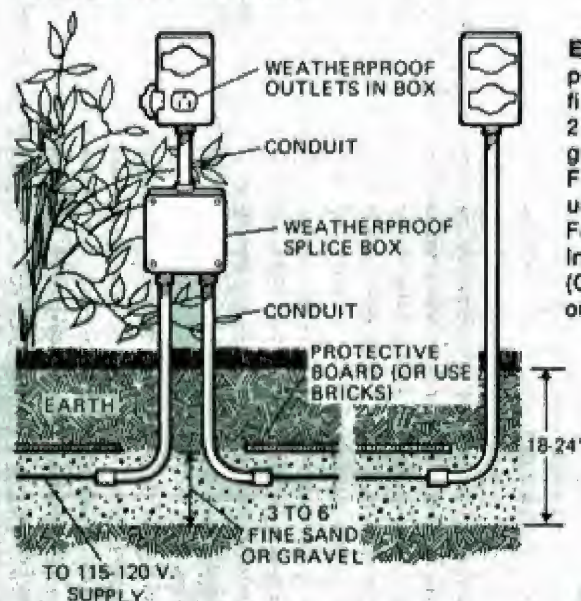


Accent lighting is fun, usually provides the final touch. Fixtures are often shaped to resemble common garden elements such as lily pads and toadstools. Lily-pad fixtures are designed for use in water; follow maker's installation instructions.

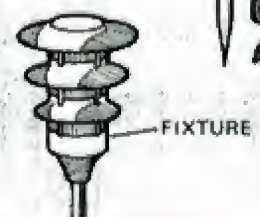
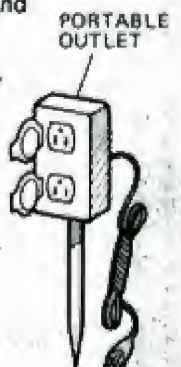
Turn your imagination loose to create do-it-yourself fixtures from objects you may have lying about your yard. Start by looking for places to hide a light; here, lamps are placed in a flowerpot, watering can and coffee can. Fixtures like these should be stored away when you've not using them.



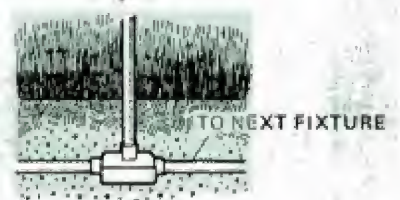
OUTDOOR WIRING



Extension cords and portable outlet fixtures come in 2 and 3-conductor grounded types. For top safety, use Ground Fault Circuit Interrupter (GFCI) outlets.



Unless you're experienced at electrical work and familiar with the codes, leave permanent outdoor wiring chores to the professionals. Use ground burial cable (type UF) in trenches to areas to be lighted. The cable is then connected to weatherproof outlet boxes or to underground junction boxes for fixtures.



HOW TO KEEP YOUR



Photo: Beard-Poulan Co.

Having the right saw chain on your chain saw and making sure it is kept sharp is the surest way of getting the most out of the tool. You can tell when your chain is getting dull by the size of the chips that fall at your feet. When the chain is sharp, the chips are large. A dull chain, on the other hand, spews out small, almost powdery sawdust.

A sharp chain will slice through a log with little pressure, whereas a dull chain requires excessive pressure, causing rapid wear of chain, bar and sprocket, as well as overloading of the engine. It takes only a few file strokes to keep a chain cutting efficiently. The correct way to file a chain, plus other information on maintaining your saw, is covered in a booklet, *All About Using Chain Saws*, excerpted here. For a copy send \$1 to Omark Industries, 9701 S.E. McLoughlin Blvd., Portland, Ore. 97722.

HOW TO SELECT THE RIGHT SAW CHAIN

Series	No.	Pitch	Gauge	No.	Pitch	Gauge	Series
MICRO CHISEL				102C	.250"	.050"	CHIPPER
				45C	.354"	.058"	
				12C	3/8"	.050"	
				51AC	.404"	.058"	
				52AC	.404"	.063"	
				50C	7/16"	.050"	
				61AC	7/16"	.058"	
				62AC	1/2"	.063"	
				9AC	1/2"	.058"	
				10AC	3/4"	.063"	
Fast, versatile with semisquare cutting edges. Easy to maintain with round file. A variety of sizes to fit most saws.	20	.325"	.050"	11AC	3/4"	.122"	World favorite for over 20 years. Sizes for all saws, all timber. Fast cutting, easy sharpening. A real workhorse.
	21	.325"	.058"	11BC	3/4"	.122"	
	22	3/8"	.050"				
	23	3/8"	.058"				
	24	3/8"	.063"				
	25	.250"	.050"				
	26	.404"	.058"				
	27	.404"	.063"				
	28	.404"	.050"				
CHISEL				72D	3/8"	.050"	OREGON S-70
				73D	3/8"	.058"	
				75D	3/8"	.063"	
9AL	1/2"	.058"	A good chain for lightweight compact saws. Cuts fast and smooth. Easily sharpened with round file.				
	10AL	1/2"		.063"			
SUPER CHISEL	50L	.404"	.050"	58AC	.404"	.058"	MICRO BIT
	51L	.404"	.058"	59AC	.404"	.063"	
	52L	.404"	.063"	68C	7/16"	.058"	
	50AL	.404"	.050"	69C	7/16"	.063"	
	51AL	.404"	.058"	31C	1/2"	.058"	
	52AL	.404"	.063"	32C	1/2"	.063"	
OREGON 80	84	.404"	.063"	Guards links are available on .325" and 3/8"-pitch micro chisel and 3/8" pitch S-70 (Speed guard).			GUARD LINK
	85	.404"	.058"				
	86	.404"	.058"				
	87	.325"	.050"				
	88	.325"	.058"				
Fastest, smoothest chain made. Sharpens in seconds with Power Sharp system. Can also be hand-sharpened.							

CHAIN SAW CUTTING

CHAIN-SAW TROUBLESHOOTING

Most chain-saw problems are caused by incorrect filing and improper chain tensions. Here are some common problems, their causes and remedies:

Cutters won't stay sharp

CAUSES	REMEDIES
1. Incorrect filing angle (blunt or sloped).	Hold file correctly. Use a file holder.
2. Depth gauges too high.	Lower the depth gauges uniformly. Use depth-gauge jointer of the correct size.
3. Cutter lengths not uniform.	File all cutters to the same length.
4. Chain not tensioned properly.	Adjust tension.
5. Abrasive wear on cutters due to dirt and sand.	File away all abrasive damage. File undamaged cutters so that they match in length.

Chain cuts roughly, chatters or grabs

CAUSES	REMEDIES
1. Incorrect filing angles: feathered edge, hook, back-sloped, top angle not 35°.	File to specifications. Use a file holder and watch carefully to see that you are holding the file in correct position.
2. Depth gauges set unevenly.	Use jointer and file uniformly.
3. Improper chain tension.	Adjust tension correctly. <i>Caution:</i> When adjusting chain tension, be sure saw is turned off. If electric, see also that it is unplugged.
4. Worn sprocket.	Replace sprocket.
5. Rivet bearings worn out due to lack of oil.	Replace chain. Always use plenty of oil when cutting.

Chain doesn't cut straight (slanted cut)

CAUSES	REMEDIES
1. Saw not supported properly.	Hold saw with both hands and guide it through the cut.
2. Cutters not filed uniformly; one side of chain uneven.	File all cutters to same length and angles.
3. Depth gauges not uniform; some being higher than others.	Lower all gauges to the same setting; use jointer of the correct size.
4. Abrasive damage to cutters on one side of chain.	File away damaged portions, then file undamaged cutters to match.
5. Bar rails worn and spread.	Have bar rebuilt or replaced.

How to break in your saw

Before starting your saw, do the following:

1. Be sure the chain is mounted correctly, facing the right direction and properly tensioned. If possible, soak the chain in oil overnight before using it.
2. Fill the chain-oil tank with chain oil and check the chain oiler button to be sure it's working.
3. If it's a gas-operated chain saw, mix fuel and oil for engine in a clean container in the proper proportion. Use chain-saw oil recommended by the manufacturer. With an electric model, you can start cutting as soon as the tool is plugged in.

To adjust tension, loosen the bar stud nuts slightly. On hard-nose bars, tighten the tension screw until you can just pull the chain around the bar by hand. Hold tip of bar up while adjusting the tension screw and tightening the stud nuts. Otherwise, the chain will loosen on the first cut. Pump the oiler a few times, while pulling the chain around the bar by hand. Then start the saw and run the chain at fast idle for two minutes—without cutting! Stop the saw and recheck the tension. To check tension, let the chain cool and pump the oiler while pulling the chain around the bar by hand. Snap the chain in the bar groove to loosen and straighten all parts. If chain is loose, readjust tension.

Start cutting—only small limbs or logs for the first half hour. Use plenty of chain oil during break-in period and watch chain tension. A new chain will "stretch" during break-in and become loose. A chain can be ruined in five minutes of cutting if it is too loose. If it is too tight or slow cutting, excess heat and friction cause rapid wear.

Type and size of saw

Most saws are of the direct-drive type today. There are gear-drive saws available, used mostly by professionals. The direct-drive saw is lighter, has fewer parts, requires less maintenance. It's easier to use, less tiring as the chain speed pulls the saw through the log without pressure. It cuts easily on any part of the bar.

For the occasional user, a lightweight saw is the best choice. Power is difficult to determine as there are no published horsepower ratings. The cubic-inch displacement of the engine is a rough guide to power—the larger the displacement, the higher the power. But there are other factors which affect the power output, such as compression, type of valving, and timing. The type of cutting chain, sprocket and guide bar are very important in the efficient use of available power. A small-pitch, fast-cutting chain running in a low-friction roller nose bar can effectively increase power. ★★

on the same averaging system as the calculators and, like them, require an "average" negative. The best analyzers read a small, specific spot of the enlarger-projected image, such as a middle tone on a person's face.

Unfortunately, no two people have the same kind of complexion, so results may not be all that exact, even with these electronic aids. Professionals frequently shoot test shots of gray cards at the beginning of each roll and with each change of subject illumination, to give their analyzers a standard spot to read.

Personally, I use neither calculators nor analyzers. I simply make a contact sheet of the negatives I want to print. With very little experience and, perhaps, a set of viewing filters (see page 78) to help out, you can quickly determine the proper pack to print almost any frame on such a color contact sheet, with an accuracy at least as good as that obtained with these devices, and at less cost—especially if you'd normally make a contact sheet for your records, anyway.

So take my word, you can quickly master the skills required on the dry side of the color darkroom, too.

The easiest—but not the only—way to set up a filter pack, is with a color enlarger (or a color head for your existing enlarger, if one's available). All the filters are built in—all you do is set two of three dials for the filtration you want, and you have it. Some heads have an additional control that lets you focus by bright light without affecting your filter setting—handy, but a luxury. Color enlargers for 35-mm or 120 film run from \$250 to \$500; color heads, \$125 to \$250. Less conveniently, but at a lot lower cost, you can use individual CP (Color Printing) filters (about \$30 per set) that fit into the filter drawer above the negative stage of your enlarger.

If your enlarger has no drawer, you'll need color compensating (CC) filters and a holder that swings in below the lens. CC filters must be more optically perfect than CP's since they go between the negative and the paper, and must be handled more carefully. You'll also need a heat-absorbing glass and a CP2B ultraviolet filter with either CC or CP filters, for about \$5 more.

What else do you need? If you don't already own one, you should acquire a good thermometer accurate to about $\frac{1}{2}^{\circ}$ F., with a quick response time (\$5). About the only other thing you will need is a daylight processing drum (around \$20 for 8x10 prints) so you can avoid

Where the filters go



Under-lens filters fit any enlarger—but must be the expensive, fragile CC type.



Filter drawers found in many enlargers take inexpensive CP acetate filters.



Color heads let you dial in exact filtration wanted; diffuse light to minimize negative spots, scratches and finger marks.

working in trays in the dark (and do avoid it—it's no fun at all). If you're in a position to spend another \$50, invest in a motor base to agitate the drum at a uniform rate; but if money's tight now, you can always add one later.

Now that I've allayed your fears, I hope, it's time to explore the rewards in doing your own color prints, rather than letting the corner drugstore do it.

The big advantage of doing your own color printing is control: control not only over quality but over cropping, burning, dodging, paper surface, finish, mood, balance and so on. These are the same reasons that anyone who is serious about his black-and-white photography will never dream of sending his negatives out to the drugstore for printing.

The black-and-white photographer can send his shots to a custom lab, with detailed instructions on development and printing; but when you go that route with color, you'd better be very, very rich. Costs for first-rate lab work are fierce, and there are very few first-rate workers, even if you can afford them.

But there is one function the corner drugstore can serve—if the druggist sends your color shots to the film's manufacturer for processing, you can leave your exposed color-negative film for *development only*. For, while the black-and-white worker can exercise a great deal of control over his final printed results by the way he processes his negatives, this isn't as true in color. Instead of juggling the processing to get the results you want, you're largely restricted to following the manufacturer's recommendations very closely.

Temperature, for instance, is specified to be held within $\pm\frac{1}{2}^{\circ}$ F. during part of Kodak's home processing routine for Kodacolor, though for practical purposes it's not really all that critical. So the best you can hope to do is to spend between a quarter of an hour to and hour (depending on which chemistry you decide to use) working under restrictive conditions to process your negatives almost as well as the film's manufacturer will do it for you—and at just about the same or even greater cost, unless you shoot and process very large quantities of film. If your druggist says he won't send out your film for developing only (no prints), either he's ignorant of the fact that this is a standard Kodak service (at about \$2.20 per 36-exposure roll of 35-mm film) or he doesn't deal with Kodak (the Agfa, Fuji and GAF labs work by mail), but only with an

(Please turn to page 122)

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IT'S EASY TO MAKE COLOR PRINTS AT HOME (Continued from page 120)

independent processor. I avoid independent processors.

The same holds true of color slides, by the way, with one exception: It is possible to "push" slide films to higher speeds in home (or custom) processing. Again, unless you expect to do this often, you won't save much money over what even a custom lab would charge, and probably won't develop the expertise to be sure of doing it right every time, either.

Now that you are, I hope, unafraid, motivated, and have some properly developed negatives on hand, it's time to mention that there have been a lot of improvements in color darkroom equipment beyond those I've mentioned. A principal one is the color head, which I referred to earlier as the easiest way to color filtration. What I didn't mention is that these heads also turn your enlarger from a condenser to a diffuser type, which suppresses print spots caused by dust, scratches, fingermarks and so forth on the negative. If you don't like spotting black-and-white prints, wait till you try it with color! And the filters in today's color heads are "dichroic" types that don't fade like acetate CP and gelatin CC filters.

While the 8x10 drums are standard for beginners, 16x20 drums are another nice luxury item. They can make four 8x10s or two 11x14s at the same time, thus cutting your processing time. Print-and-repeat easels, which let you make a number of smaller prints on one 8x10 sheet, also help you save time on the wet side of your darkroom. Drums are available from Beseler, Omega, Simmard (in Canada), Unicolor and several others. Kodak's is sold only in England. Motor bases are available from Simmard, Beseler, Omega and Unicolor. Print-and-repeat easels are available from Omega, Premier, Unicolor and others.

There are two basic papers to choose from: type A and type B. Type A (which must be dried before you evaluate its color balance) is sold by Kodak, Beseler, Omega and Unicolor, among others, with GAF manufacturing the papers for the latter three. All of these papers are plastic-coated (RC) types, though, so you don't have to wait long for them to dry.

Type B papers, which can be evaluated when still wet, are sold by Unicolor and Agfa (but I still can't find any of the Agfa products on the shelves in New York where I shop).

All of the firms mentioned above also sell processing chemicals. Processing takes between 8 and 10 min-

utes per print, except with Beseler's system, which is claimed to turn out good prints in about two minutes and only three steps.

If you shoot color slides, you have two choices for print-making: You can make internegatives, or have them made, and print from those; or you can make color prints directly from transparencies, using color paper and chemicals from Kodak, Cibachrome or Unicolor.

Kodak's current slide-printing paper is called Type 1993, and is quite simple to use: Once a filter pack is determined (including infrared and ultraviolet filtration), that filter pack will print almost any slide properly. Results are contrasty but otherwise quite good, but the paper requires long exposures. Kodak in France has a paper called RD-14 which is said to be about 14 to 15 times faster, and makes Type 1993 look like greasy kid stuff—I can't wait for Rochester to catch up. The Cibachrome P-12 process, in my very limited experience with it, seems to have four main disadvantages compared to the Kodak process (less maximum density, higher cost, higher contrast and a decided lack of consistency) but two big advantages, too. While all color prints fade, Cibachromes fade much more slowly than any others, and their colors are tremendously saturated to begin with.

Keeping track of color printing developments these days is a sort of Alice-in-Wonderland problem: Blink your eyes, and there's something new and strange in front of you. But all of the new wonder developments are likely to follow the same basic rules as the existing ones do. So the basic color-printing skills you learn now probably won't become obsolete. If you've been putting off your first try at color printing while waiting to see what tomorrow may bring, you need wait no longer. Tomorrow will be better than today. But today is pretty good. ★★

THE MILES-PER-GALLON GAME

(Continued from page 62)

by Michael Lamm

0.003-0.004-inch running clearance. Compression went from 5:1 to 6:1 and the rocker arms got needle bearings. The engineers built a special intake manifold, mounted a tiny carburetor, converted the ignition to 12 volt, put in special wide-gap plugs covered the radiator and insulated the block for optimum heat retention, and poured SAE 5-weight oil into the crankcase.

This roadster ran no fan, used to

ty bald tires pumped up to 150 p.s.i., and even the generator was cut to the minimum voltage. At steady cruising speeds instead of burst driving, this 24 Chevrolet averaged about 50 mpg. In bursts, it tripled that.

Turning now to the 1959 Opel, we did most of the above tricks incorporated, but with the addition of a few new ones. First, it's a three-speeder, with the engine mounted transversely in the rear. It has no multi-gear transmission—just a single-speed—and it uses chain drive to single rear wheel. This arrangement reduces friction and includes a freewheeling device to aid in coasting. There's no need to throw in the clutch or take the transmission out of gear with freewheeling.

Tires are not only bald, but the tread is trimmed so that only a one-inch strip in the center touches the ground. To further reduce rolling resistance, all tires are inflated to 200 p.s.i. Wheel bearings are so delicately adjusted that spinning one tire by hand keeps it rotating for more than half an hour. The usual 90-weight motor lubricant is replaced with 5-weight engine oil.

Since these cars never go above 15 mph, wind drag isn't much of a factor, and all use full belly-pans and home-made streamlining, usually built of cardboard. Weight, of course, is kept to a minimum.

What are *your* chances of cracking the 100-mpg barrier, you ask? Not likely in the old family bus, I'm afraid. I tried out the burst-driving thing long ago in a 1975 Honda CVCC hatchback, using 5 and 30 mph as my test limits. Over a 10-mile level course, I managed to get 54.4 mpg. It was in fourth gear. At a steady 30 mph, this same car got only (only!) 15 mpg. So burst driving does work, and if you should ever find yourself stuck 50 miles away from a filling station with only a gallon of gas left in your tank, you might try it as a last resort. ★ ★ ★

(Continued from page 63)

Nils Nelson

ings for the distributor, and new parts for the carburetor. You'll have to add points, plugs, condenser, but it turns out to be one big tune-up. They convinced me it was better to have them do it because the distributor needs to be recurved on a machine. This was the only job I did not perform myself, and it was worth having them do it. Not only did the engine get done properly, but they got me on by the project and have provided me with constant technical assistance and testing on emissions equipment and the Dyno machine.

Along with the kit, I installed a Judson Electronic Magneto, which increases the spark from a stock 20,000 volts to a minimum of 30,000 volts. In a well-tuned condition, my spark has been measuring 50,000 volts. This has got to be burning more gas, more efficiently.

At this point, I became aware of a device called a vapor injector. The principle, as explained to me, is that it further breaks down gas in the carburetor and makes a finer vapor. It sounded like a good idea, so I got in touch with APO of America here in Dallas and got one. I had expected a 20-percent increase in mpg, so when I got 10 percent, I talked to them. After learning what I had already done, they patiently explained there was a limit to what could be done with an already efficient engine. In fairness, I really believe that if it had been one of the initial improvements I probably would have gotten closer to 20 percent.

My final modification was one I had been deliberately putting off. First, because the average car-owner wouldn't do it; second, because I'm really not the hot-rod type vroom-vrooming around town. Headers and tuned exhaust had been recommended since I first started talking about this project. I finally ordered a set from Sparco, an outfit that specializes in performance parts for Pintos. Fear One vanished because it really is a simple job—old parts out, new ones in thanks to clear instructions, and all necessary parts installed in about four hours with not a knuckle skinned.

It's quite important to note here that the larger jets supplied with the Dyno tuning kit keep the improved exhaust system from scavenging all the gas which would otherwise cause lean running and would eventually burn valves. As far as noise goes, it's not much louder, but it sounds better—kind of mellow.

I sat down, checked test results and mpg figures I've been keeping for a year and a half. No, I didn't get the 100-percent mpg improvement I had hoped for. But for around-town driving, the improvement was a 32-percent increase in mpg. Turnpike driving at a steady, sensible 50 mph yielded a really good 82-percent mpg increase. What really surprised me was the final test on the Dyno and emission-test equipment. A 91-percent increase in hp—which every Pinto can use! Emissions tested: hydrocarbons 185 parts per million and carbon monoxide 2 percent at idle—both well below 1975 standards—even in California.

All this for a cost of \$259. I think it was worth it. ★ ★ ★

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Trailer hitches vs. the new bumpers

Can you clamp a hitch ball behind your new car? The answer seems to be: "Yes, if . . ."

by Ray Gill

Until recently, towing a trailer behind your car seemed to be getting easier and better every year. For lightweight loads like a lawnmower on a flatbed, a small boat rig or a tent trailer, you clamped a hitch on your rear bumper and off you went. With that most popular of all recreational vehicles, the travel trailer, you considered a larger tow car or small truck and learned about frame-mounted weight-equalizing hitches for the long haul. Or if you wanted to move furniture or bulky gear, you went to a cargo trailer rental outfit and they supplied you with a detachable multiclamp bumper hitch to tow it.

But now conditions have changed. The revised automotive industry standards to make bumpers able to withstand five-mph collisions have raised questions about attachment of hitches to these new shock-absorbing units. Experience since the introduction of 1973 model cars with impact-absorbing bumpers has shown that bumper hookup with the proper types of hitches can be very satisfactory.

Recently, however there has been a new suggestion that the National Highway Traffic Safety Administration relax the five-mph requirement and allow lighter "soft" plastic bumpers in order to "save gas" and possibly cut costs to help car sales. The proposed bumpers, it is believed,

would not take either bumper hitches or bumper jacks. Some car manufacturers are even recommending against the use of bumper hitches on present cars.

So where does that leave you if you want to tow a trailer? With current passenger cars, figure the small compact can handle light trailers up to 1000 pounds, tongue weight of 100 pounds. Bumper hitches should prove satisfactory on any car for occasional trips when towing these light loads. The installation, however, should not include a rigid connection between the impact-absorbing bumper and the car frame, preventing the bumper from functioning properly.

Manufacturers recommend frame-mounted hitches, along with the other components of special trailer-towing packages such as extra cooling and heavy-duty suspension, when regular long trips with heavy trailers are planned. Chrysler, for example, now offers a Heavy Trailer Tow Package that will handle trailers up to 6000 pounds when used on Chrysler-Plymouth intermediate cars, and up to 7000 pounds on full-size cars.

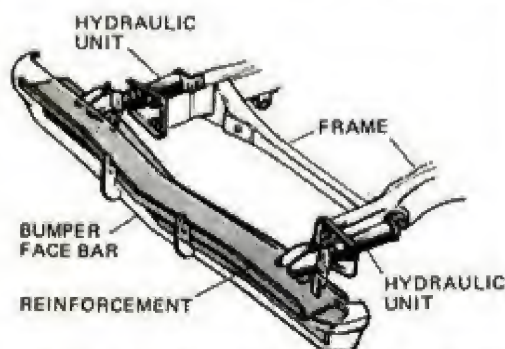
Included are a load-distributing hitch platform, trailer brake control-

ler, dual battery-charging circuitry, wiring harness with connector and 65-ampere alternator. Also recommended are heavy-duty suspension, wide-rim wheels with appropriate tires, constant-rate signal flasher, high-amp. battery, 3.23-to-1 rear axle ratio, maximum cooling system with recovery bottle, and auxiliary transmission oil cooler. Ford, General Motors and International are offering similar packages.

Individual trailer hitch manufacturers such as Reese, of Elkhart, Ind., and Valley Tow-Rite, in Lodi, Calif., provide under-chassis-attachment hitches which can be clamped, bolted or welded in place and which do not secure to the bumper. Some keep the square tow-bar sleeve shorter than the bumper to prevent impact to chassis through the tow bar itself. A Valley Tow-Rite hitch for the Volkswagen attaches to the rear bumper but uses a U-bolt which lets the no-damage feature function.

Carmakers recommend against the use of axle-mounted hitches because of the chance of damage to housing, bearings, wheels or tires, and warn that a chassis-mount hitch must clear the gas tank with enough space to prevent chafing.

Insurance company figures indicate that five-mph bumpers can mean savings of up to 85 percent in a low-speed crash and present standards should not be relaxed. ★★★



Attachment of hitches, particularly of the detachable multiclamp type, has proved out on bumpers like this Dodge hydraulic.



Installation of bolt-on hitches can bypass bumper and allow switching to new model if car is sold. Hitch must not chafe tank.



With hitch sleeve behind bumper and tow ball arm removed when not in use, rear impact will not pass from sleeve to chassis.

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257 VACATIONLANDS—READY AND WAITING (Continued from page 57)

Golden Gate in San Francisco, are being added to the roster, and Congress is considering the addition of parks in the Santa Monica Mountains of Los Angeles, the Potomac River near Washington and the Chattahoochee River outside Atlanta. National preserves and shrines, monuments and historical sites are scattered through the 50 states, Puerto Rico and the Virgin Islands, and are available to all.

Information about specific parks may be obtained by writing in advance to the U.S. Government Printing Office, Washington, D.C. 20402, or directly to the parks. Many are very popular and can be crowded on occasion. This year, campers should write for reservations to Acadia, Me.; Grand Canyon, Ariz.; Mount McKinley, Alaska; and Platt, Okla. Other parks expect to offer campsites on a first-come, first-served basis.

One way to avoid peak midsummer crowds is to pick the lesser-known locations. Listed here are particularly popular spots *plus* our choices of additional sites having a special appeal:

Alaska—Mount McKinley Nat'l Park, Box 9, McKinley Park, 99755. Plus, Glacier Bay Nat'l Monument, Gustavus, 99825, with tidewater glaciers, forests, rare wildlife.

Arizona—Grand Canyon Nat'l Park, Box 129, Grand Canyon, 86023. Plus, Organ Pipe Cactus Nat'l Monument, Box 38, Ajo, 85321, in Sonoran Desert near Mexican border.

Arkansas—Hot Springs Nat'l Park, Box 1219, Hot Springs, 71901.

California—Point Reyes Nat'l Seashore, Point Reyes, 94956. Yosemite Nat'l Park, Box 577, Yosemite Park, 95389. Plus, Pinnacles Nat'l Monument, Paicines, 95043, with volcanic pinnacles, caves, canyons.

Colorado—Rocky Mountain Nat'l Park, Estes Park, 80517. Plus, Dinosaur Nat'l Monument, Box 101, Dinosaur, 81610, panorama of canyons cut by Green, Yampa Rivers.

Florida—Everglades Nat'l Park, Box 279, Homestead, 33030. Plus, Biscayne Nat'l Monument, Box 1369, Homestead, with a living coral reef, boating, fishing, scuba.

Hawaii—Haleakala Nat'l Park, Box 456, Kahului, Maui, 96732.

Idaho—Craters of the Moon Nat'l Monument, Box 29, Arco, 83213, with moonlike volcanic formations.

Iowa—Effigy Mounds Nat'l Monument, Box K, McGregor, 52157, with 1000-year-old Indian mounds shaped like birds and animals.

Kentucky—Cumberland Gap Nat'l Historical Park, Box 840, Middlesboro, 40965. Famous Civil War region where Boone blazed his Wilderness Trail in 1775.

Maine—Acadia Nat'l Park, Box 1, Bar Harbor, 04609.

Maryland—Assateague Island Nat'l Seashore, Box 294, Berlin, 21811.

Massachusetts—Cape Cod Nat'l Seashore, South Wellfleet, 02863.

Michigan—Isle Royale Nat'l Park, 87 North Ripley St., Houghton, 49931.

Minnesota—Voyageurs Nat'l Park, Box 50, International Falls, 56649. Plus, Grand Portage

Nat'l Monument, Box 666, Grand Marais, 55604, where Great Lakes fur traders from Montreal crossed overland to the interior.

Montana—Glacier Nat'l Park, West Glacier, 59936. Plus, Bighorn Nat'l Recreation Area, Box 458 YRS, Hardin, 59022, with game, fishing, agate and fossil collecting.

Nevada—Lake Mead Nat'l Recreation Area, 601 Nevada Hwy., Boulder City, 89005. Plus, Lehman Caves Nat'l Monument, Baker, 89311, where underground tour follows limestone tunnels and galleries.

New Jersey—Delaware Water Gap Nat'l Recreation Area, Columbia, 07832.

New Mexico—Carlsbad Caverns Nat'l Park, 3225 El Paso Rd., Carlsbad, 88220. Plus, Chaco Canyon Nat'l Monument, Box 539, Farmington, 87401, with major Indian ruins, nature trails, campground.

New York—Fire Island Nat'l Seashore, NPS, 26 Wall St., New York City, 10005.

North Carolina—Cape Hatteras Nat'l Seashore, Manteo, 27954. Plus, Blue Ridge Parkway, Box 7606, Asheville, 28807, running 473 miles along scenic mountain crests.

Oklahoma—Platt Nat'l Park, Box 201, Sulphur, 73086.

South Dakota—Wind Cave Nat'l Park, Hot Springs, 57747. Mount Rushmore Nat'l Monument, Keystone, 57751.

Tennessee—Great Smoky Mountains Nat'l Park, Gatlinburg, 37738.

Texas—Padre Island Nat'l Seashore, Box 8580, Corpus Christi, 78412. Plus, Big Bend Nat'l Park, 79834, with mountains and deserts in great bend of the Rio Grande River.

Utah—Zion Nat'l Park, Springdale, 84767. Plus, Canyonlands Nat'l Park, Moab, 82532, where the Green and Colorado Rivers converge in spectacular red-rock canyons.

Virgin Islands—Buck Island Reef Nat'l Monument, Box 160, Christiansted, St. Croix, 00820.

Washington—Olympic Nat'l Park, Port Angeles, 98362. Plus, Coulee Dam Nat'l Recreation Area, Box 37, Coulee Dam, 99116, sailing, fishing, hunting, camping, swimming, scenery.

Wyoming—Yellowstone Nat'l Park, 82190. Plus, Devil's Tower Nat'l Monument, Devil's Tower, 82714, 865-foot natural rock column overlooking forests; hiking, camping.

In addition to these and hundreds of other points of interest in the National Park System, there are often state-run recreational areas near popular national parks that may be less well known and crowded. For information write to Dept. of Tourism of the state involved. It can usually furnish lists of adjacent motels, cabins and lodges as well.

For overall information, the Government Printing office sells a *National Park Map and Guide* for 35 cents listing all installations with addresses, with checklists for campgrounds, swimming, boating, horseback riding, winter sports and other activities. Additional 30-cent booklets cover camping, fishing and boating regulations in the National Park System. A booklet on *Winter Activities* is 35 cents, a map folders packet, \$1.50. Our parks remain one of our great bargain vacations. ★ ★ ★

(Continued from page 73)

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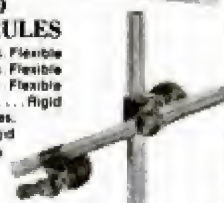
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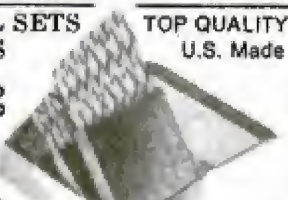
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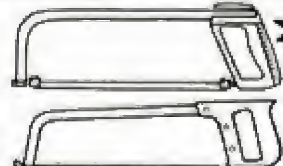
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TRANSATLANTIC BALLOON JINX: WHO'LL BE FIRST TO BEAT IT?

(Continued from page 129)

Great Northwest was the biggest transatlantic balloon ever built. On Sept. 12, 1881, with King and six passengers aboard, it took off from Minneapolis on a flight to New York, planned as the first stage of a voyage to Europe. Narrowly missing a dunking in the Mississippi, the *Great Northwest* came down near Minneapolis's twin city, St. Paul. King never attempted the ocean crossing for which this lighter-than-air monster was built.

Eighty-five years after the last try at ballooning across the Atlantic, a British team—Arnold Eiloart, his son, Tim; Colin Mudie and his wife, Rosemary—attempted an east-west crossing from the Canary Islands to the West Indies. On Dec. 12, 1958, they set out from Tenerife in their 53,000-cubic-foot hydrogen balloon *Small World*. Forced down by a violent storm, after nearly four days and some 1200 miles of flying, the Eiloarts and Mudies sailed their gondola, a seaworthy boat, the rest of the way—1500 miles—to Barbados, arriving there Jan. 5, 1960, after three harrowing weeks at sea.

In spring, 1968, Francis Brenton, described by the press as "a British-born adventurer from Chicago," made several unsuccessful attempts to get underway on a balloon trip from the Canary Islands to the Bahamas. At Madeira in 1969, he scrubbed another transatlantic flight when his balloon could not lift the loaded gondola.

Two Canadian actors, Jerry Kostur and Mark Winters, tried on Aug. 10, 1968 to fly to Europe in the *Maple Leaf*, a 32,000-cubic-foot balloon with a 15-foot plastic boat for a gondola. Short of helium at launching, the *Maple Leaf* never rose higher than 200 feet and spent most of the flight bouncing off the waves. After 17 hours of this, Kostur and Winters released the balloon and waited in their boat to be picked up. Spotted 45 miles southeast of Halifax, they were rescued by a fishing trawler. Their adventure had lasted 24 hours.

The tragic flight of *The Free Life* cost the lives of Rod Anderson, his wife, Pamela, and their British pilot, Malcolm Brighton. It began at East Hampton, N.Y., on Sept. 20, 1970—too late in the year for favorable weather over the North Atlantic.

Thirty hours and some 1000 miles into the flight, they encountered storms southeast of Newfoundland. Brighton radioed Gander: "Now at 600 feet and descending. Signing off to go through safest possible landing procedure. Will try

to contact you after landing. Over and out." *The Free Life* was never heard from again. A 19-day air and sea search failed to find any trace of the lost balloon or its crew.

It is believed that *The Free Life* dropped into high seas and was dragged under, all hands drowning as they tried to hack away the 10 heavy straps joining the balloon to the gondola. Reportedly, owner Rod Anderson had refused to install a quick-release system, the safety device that might have saved their lives.

Originally, this balloon was a good one, similar to Bob Sparks's *Yankee Zephyr* and *Odyssey*, but it had been extensively modified against the builder's advice. *The Free Life* took off with a three-foot tear in the outer envelope and the propane burner was out of order, so the essential system for maintaining the helium at

It is believed *The Free Life* dropped into high seas and was dragged under, all hands drowning as they tried to hack away 10 heavy straps joining the balloon to the gondola.

constant temperature was inoperative. Experts say this flight was foredoomed.

Early in the morning of Aug. 8, 1973, Bob Sparks lifted off from Bar Harbor, Me., alone in the *Yankee Zephyr*, headed for Europe on a westerly wind. Through the day, all systems worked perfectly; weather advisories were favorable. Before signing off to bed down for the night at 8:25 p.m., Sparks radioed from over Prince Edward Island: "It's a going balloon!"

An hour later, he awakened to find himself in the middle of a freak thunderstorm that hurled the *Yankee Zephyr* as high as 13,000 feet and dragged it down to less than 1000 feet from the ocean. For seven terrible hours, while the storm raged around him, Sparks fought desperately to stay aloft. Finally, exhausted and convinced that his balloon could not keep flying, he released it, splashing down in the gondola at 4:35 a.m. on Aug. 9, 45 miles northeast of St. John's, Newfoundland. The *Yankee Zephyr* had traveled about 850 miles in almost 24 hours. The Canadian Coast Guard found Bob Sparks at noon that day, riding eight-foot waves in his 14-foot open boat.

Tom Gatch planned to travel the

70-mph jet stream to Europe, at 39,000 feet—above uncertain weather—sealed in a six-foot pressurized sphere suspended below a flotilla of ten 23-foot superpressure helium balloons. Taking off from Harrisburg, Pa., on the evening of Feb. 18, 1974, he expected to reach France or Spain in a few days.

Just 75 minutes into the flight, Gatch radioed that a balloon had burst, causing a sudden 3000-foot drop in altitude, and that, after he released ballast to compensate, the aerostat leveled off at 35,550 feet. He was on a southeasterly course, in communication with ships and planes en route. Final radio contact was with a BOAC airliner at midday on Feb. 19. Gatch was then 925 miles northeast of San Juan, Puerto Rico.

Two days later, the *Light Heart* was sighted by the Liberian freighter, *Ore Meridian*, 1000 miles west of the Canary Islands. There were no signs of life as the aerostat drifted slowly by, only 1000 feet up, its balloons slack, the orange signal banner dragging limply below the gondola, registration number panel and U.S. flag gone. The *Light Heart* vanished over the horizon and was never seen again. Unaware of Gatch's flight, the captain of the *Ore Meridian* assumed that the strange craft was unmanned, did not investigate, and only some time later made a routine report of the sighting. Subsequent land, sea and air searches found nothing. Tom Gatch and the *Light Heart* had disappeared.

The *Spirit of Man* was designed, built, and flown by Bob Berger. Confident that his homebuilt jetstream balloon would carry him to France, fame and fortune, he bet his life on it and lost. Cramped into the gondola of the 115-foot-tall helium balloon, he took off from Lakehurst, N.J., on Aug. 6, 1974. About an hour into the flight, during which time there had been no radio contact, fishermen in nearby Barnegat Bay spotted the balloon at an altitude of several miles. They watched it descend slowly, then the envelope seemed to collapse and the *Spirit of Man* crashed into the water. Berger was dead when rescuers reached him.

Forbes Magazine's Atlantic Project, was the most elaborate and technically sophisticated transatlantic balloon attempt in history. It is said to have cost about \$1 million—twice as much as all previous attempts combined. Involved were communications links with satellites, computerization of flight data, even an airborne mission control center aboard

Forbes' DC-9, the *Capitalist Tool*.

Christened *Windborne*, the vehicle itself was right out of a science fiction movie. A one-ton, pressurized gondola for two was suspended below a flotilla of thirteen 33-foot superpressure helium balloons arranged in clusters, making the height of the whole structure 624 feet—about 60 stories tall.

The flight plan, like those of the ill-fated Gatch and Berger, was to rise to 40,000 feet, pick up the jet stream and get blown to Europe. However, *Forbes'* plan called for a West Coast launch, permitting systems checks over continental United States, with an abort possibility before entering the wet cruise phase.

At 3:00 a.m. on Jan. 6, 1975, millionaire publisher Malcolm Forbes and his scientist copilot, Dr. Thomas Heinsheimer, were inside the *Windborne's* 7½-foot gondola, awaiting lift-off. Then one of the balloon clusters broke its mooring and dragged the gondola for 20 feet, bouncing it across the concrete runway. Water ballast tanks ruptured and the liquid oxygen store was in danger of exploding. Launch director Jean Pierre Pommerau pulled the outside emergency release, cutting loose the balloons and aborting the flight. As he climbed from the gondola, Forbes wryly remarked: "So far, the Atlantic Project is the most expensive 20-foot trip in history."

The strung-out, 13-balloon flotilla was too complicated, presented too many possibilities of handling problems on the ground and during flight, and for entanglement, rubbing and bursting of balloons.

Recently, Malcolm Forbes announced that studies made since January indicate that another attempt with the same balloon system is not feasible, and that the Atlantic Project would be suspended indefinitely, pending development of an entirely new, single superpressure balloon concept.

So now it's up to Bob Sparks and the *Odyssey*. Will he make it? I think his chances are incomparably better than those of any previous attempt. The *Odyssey* is considered the best type of balloon, at the present state of the art, for transatlantic flight. Sparks not only has the courage and stamina required, but also is easily the best prepared, most experienced and competent balloonist ever to try an Atlantic crossing—factors that helped to save his life in 1973. And what about the transatlantic balloon jinx? Well, Bob Sparks doesn't believe in jinxes! ★ ★ ★

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CASE FOR THE MODULAR HOME (Continued from page 88)

builders of modular houses are a mixed lot, some good, some simply awful. If you've ever shopped carefully in your life, do it for a modular home. It's worth a visit or two to factories where such houses are made to familiarize yourself with what's involved. Certain patterns, good and bad, will be apparent, and you can plan accordingly.

Get everything in writing, particularly a salesman's rosy promises. It helps, too, to familiarize yourself with the industry's jargon; an "all costs package" may mean one thing to you, but something less to the guy trying to sell you a house. Hang around, ask questions, do your homework. Talk to owners of similar houses.

Costs can multiply like rabbits. That nifty lot you plunked down good money on can be virtually inaccessible to a dealer's work crew, meaning erecting your modular may require, say, a crane. And you have no concept of how fast money can be spent until you get into the crane-hiring business. Or you may have to have a special road bulldozed—not exactly nickels and dimes.

Building codes vary from area to area. Make sure you get in writing the dealer's promise that the house he sells you will, when erected, comply with all legal wrinkles applicable to the locale where you wish to build. If you don't, you might find yourself on the hook for on-site alterations, another way to spend money quickly.

Highway regulations and conditions limit the dimensions of modular houses somewhat. Although 14-foot-wide sections are becoming fairly common, some states won't allow sections more than 12 feet wide on their highways, so while a modular house can consist of two or more modules, the possibilities are limited.

Designs of modular homes tend to be limited, too. Floor plans and both interior and exterior appearances are often sort of blah, mainly because such houses are usually designed by engineers, rather than architects. Engineers have on-line production problems and sometimes tend to take the easiest, most workable way out. Room-dividing walls, for example, almost invariably run down the centerline between the joined house halves. This often makes for small rooms and a chopped-up floor plan even though there may be no structural reason why the walls have to be there. Since most roofs are of the self-supporting truss type requiring no internal load-bearing walls, it ought to be possible to place room partitions where you want them

—within reason, of course, and within a manufacturer's capability.

Dealers and their salesmen often insist the floor plans they show you are the only arrangements available. Maybe so. Check with the factory, and if it can't satisfy you, look around for other manufacturers that may be able to. Never accept a floor plan that doesn't please you without checking to see if an alternate, more efficient plan is structurally possible.

■ Some tips, thoughts, warnings:

Contact your local building inspector's office for a list of manufacturers whose modular houses are approved for erection in your area. If none of those listed makes a house you like, try the National Assn. of Building Manufacturers (NABM), 1619 Massachusetts Ave., Washington, D.C. 20036. The NABM lists about 50 manufacturers, all members. Remember, however, that most modular home manufacturers are *not* NABM members, so you might find handy the annual "Directory of Mod-

If you can, order your modular from nearest factory possible.

Not only does long-distance delivery add to the shipping cost, but extensive travel doesn't do a modular much good.

ular Housing Producers" published by the building trade magazine *House & Home*, 1221 Avenue of the Americas, New York, N.Y. 10020. It's \$2 and worth it because it lists about 250 such manufacturers.

Even if officialdom in your area says okay, avoid manufacturers whose moduls meet *only* the Federal Housing Administration Code minimums. Conscientious building inspectors consider the FHA Code rather weak.

If you can, order your modular from the nearest factory possible. Not only does long-distance delivery add to the shipping cost, but extensive travel doesn't do a modular much good. Nails can pop, grouting can crack, mirrors break. Also, if the distance is considerable, after-sale service can be almost impossible to get. Your sales contract should specify that the seller has checked your site and its access and can deliver your modular house accordingly. Special arrangements necessary to set the house in place should be spelled out, mutually understood and agreed upon.

Specify a heating/cooling system appropriate to your area. Electric baseboard heaters lend themselves

to assembly-line production, but may not be what you need or want. You can have just the start of a system built in. Later, when the house is up, you can have a complete and appropriate system installed.

Dealers may show you limited selections of wall and floor coverings and insist that's it. Again, maybe so. Many manufacturers will let you provide your own coverings if you get them to the factory in time for installation. In any event, check this point out carefully.

If you intend to replace any wall or floor coverings later, find out how easy or difficult it's going to be. These guys are great for glue; you may find tearing up carpet or vinyl will mean a new underfloor.

Unless his factory is near your site, don't buy a modular directly from its manufacturer unless he's willing to do everything necessary to give you a finished home. If he sells you only the house, you can get caught in a hassle between him and your site contractor regarding after-sale service. A good rule of thumb is to do business with a reputable dealer rather than the manufacturer.

Not everyone in the modular game is honest, so beware of fly-by-night outfits. Salesmen exist to make sales, and to do so they've been known to tell you what they think you want to hear, not necessarily the truth. Again, get it all in writing. If a salesperson suggests you be your own contractor, run—do not walk—to the nearest exit. Even if you're an experienced builder, don't even consider such a deal unless the salesperson agrees to act as a co-applicant for the necessary permits, thus agreeing to share responsibility for mishaps. One more time: Get it all in writing.

If you plan to make changes or additions later on (earlier we mentioned a fireplace), tell your builder/dealer beforehand so that provision for your anticipated changes can be made when your house is being built at the factory. You can thus save yourself a lot of grief—and money.

Nail down the *exact* date by which your house will be completed and you will be able to move in. Allow for strange bounces of the ball, of course, but be tough about it. Contractors can have a short attention span, too.

Before you sign a contract for a specific house, get a price from more than one builder/dealer.

The same house built on your site by different dealers in your area may vary as much as \$3000 in estimated price. Don't be surprised, but make darn sure you know why before you use your pen and checkbook. ★ ★ ★

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CASE FOR THE MOBILE HOME

(Continued from page 90)

gain. His volume buying enables him to offer the "furniture package" at a big saving over what such furnishings would cost at conventional outlets. And, a buyer can finance the "furniture package" and accompanying appliances along with the cost of the unit. In recent years, however, more dealers and manufacturers have offered such items on an optional basis, especially with double-wides.

An often-heard criticism of mobile homes is that furnishings are smaller, or scaled down, to give a unit's interior the appearance of being larger. Manufacturers say nothing is smaller, but admit some features might be scaled down slightly. Chairs and tables, say, might indeed be a bit closer to the floor than standard items. But the makers maintain—probably correctly—that "adjusting" to such slight differences is hardly noticeable.

Interiors of mobile homes can be open and handsome, albeit somewhat lacking in distinction. Many are garish, even a bit pretentious. All are "done" by interior decorators, which may or may not be your cup of tea. Keep in mind that manufacturing costs rule the day, so you'll note a lot of plastics, synthetics and fake-whatevers of one sort or another. Some units feature such things as sunken bathtubs, cocktail bars and even cathedral ceilings—touches you might find a bit much for what a small voice within you will always refer to as a trailer.

In the past, purchases of mobile homes have been financed through commercial credit outfits—finance companies. Recently, other lenders have been active, notably banks, savings and loan associations and credit unions. Like car financing, nearly all such loans are of the chattel mortgage type—fail to keep up payments and you'll lose your home.

Typical down payments run about 10 percent with the balance financed over 7 to 10 years. Some loans will run to 12 years, depending on what you want to buy and ability to pay.

It's common practice for mobile home insurance to be handled more or less in tandem with the financing. Traditionally, such insurance has been of the casualty type to protect both buyer and lender against such contingencies as fire, storm damage, theft and so on. Recently, however, as mobile homes have grown in both size and acceptance, more lenders require life insurance on the buyer. A prospective buyer should check all insurance provisions carefully; what fulfills the needs of a lender may not fulfill the needs of a buyer.

One wrinkle of mobile-home ownership is finding a spot to place the home. Aside from individual homesites—few of which are zoned to permit mobile homes—a typical buyer must arrange for the use of a lot in a mobile home park or community. Most such parks or communities are rental operations—lots or spaces are leased on a monthly basis. In newer, better-equipped parks, rents can run as high as \$60 a month, even a bit more. Older parks, with spaces renting for as little as \$30 to \$45 a month, are usually filled, and vacancies occur infrequently.

Thus, a prospective buyer should start park shopping when he starts his mobile-home shopping, maybe sooner. Never buy a mobile home until you are first assured of a place to put it. Often mobile-home dealers own or operate a park and are prepared to solve your space problems—

Careful shopping for space is advisable because a major source of occupant complaints is park management and policies. Know exactly what you can and cannot do before you sign a space-rental lease.

on their terms, of course. Or, because he wants to make sales, he'll have access to, or be familiar with, an area's available spaces. Chances are he can start you on your search, anyway. (You might find helpful Woodall's *Mobile-home Park Directory*, available from Woodall Publishing Co., 500 Hyacinth Pl., Highland Park, Ill. 60035. It costs \$5.95 and lists about 13,000 better parks, rated as to facilities and amenities.)

Careful shopping for space is advisable because a major source of occupant complaints is park management and policies. Know exactly what you can and cannot do before you sign a space-rental lease. Make sure you know beforehand what fees or charges may be involved in setting up your mobile home. Charges may run as high as \$300 to \$500, depending upon your home's size. The park management may require certain extras such as base skirting, a special entry or outside storage shed.

There may be connection fees regarding utilities. With large homes such as double-wides, special site-preparation charges could run to \$1000 or more. You might do much of this work yourself, including—later on—building a carport, porch or whatever, but, again, determine

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CASE FOR THE MOBILE HOME

(Continued from page 135)

out "that mobile homes are not as prone to fire as are other forms of single-family housing."

In Alaska, second highest of all states in percentage of mobile-home ownership, Anchorage Fire Marshal John F. Franklin reported a few years ago that his department's experience indicated that those who contend "trailers are always burning up" are off base; of 89 serious fires in the city in 1972, only three were in mobile homes.

In addition to fire hazards, you'll hear other horror stories about mobile homes—that they can be toppled over and even flattened in high winds, that materials and workmanship are often shoddy with ill-fitting doors and drawers, sagging floors and leaking roofs, that kerosene stoves and heaters are unsafe and emit foul-smelling, choking fumes. Other grim tales tell of park owners who are virtual dictators, who establish excessive demands and restrictions, who arbitrarily evict tenants for breaking even a minor park rule.

Undoubtedly, there is some truth in these accusations; then too, some are exaggerated. Many apply to the old slum park, now happily vanishing. As for storm damage, mobile homes are subject to some danger here. Current practice calls for an anchoring system—cables or straps running to tie-down points in the ground. Properly anchored, such a home should be as stable as any other under normal conditions. Construction quality, park rules and rental practices are all elements that vary widely from area to area and maker to maker. That's why you should ask questions and investigate carefully before you consider buying a mobile home.

Unfortunately, few governmental regulations have existed regarding mobile-home quality, sales practices, service requirements and park operating procedures. That situation is gradually changing. Thanks to the rapid proliferation of mobile homes and parks, more state governments and local municipalities are becoming aware of the need for appropriate regulations. Not all studies have been completed or acted on, however.

To find out the situation in your particular area, your best bet is to start with your local housing authorities. Get their opinions, recommendations, warnings, suggestions. Ask—and keep asking—until you get meaningful answers. A mobile home can be a good buy, but be sure it's the kind you want before you take the plunge. ★★★

PAD-SANDER KNOW-HOW

(Continued from page 94)

for shorter cords is both obvious and understandable. The cords are made of copper. When less of it is used, retail prices can be kept down. For my money however, I find the resulting inconvenience an expensive price to pay.

Active do-it-yourselfers will find it necessary to have on hand an extension cord for each tool in use on the bench or suffer the time-consuming inconvenience of disconnecting from one tool to plug in another each time a change is desired. If you think the short pigtail will bother you, too, stick with a model that sports a conventional-length cord.

Mounting paper

There are as many different ways of putting sandpaper in a pad sander as there are pad sanders. Some tools are easy to load and some are not. Check this feature before buying and pick a sander that makes it easy to mount and remove papers.

No matter how paper is mounted and held, it must remain flat as well as secure. The action of the sander itself is a pulling one, and if the paper is loose and flaps about, it will soon tear and become useless.

Check the maker's instructions for mounting papers and make certain that all papers you mount are stretched tightly across the pad.

The shoe (or pad) on most sanders is sized so you will be able to get three strips of paper from a standard-size sheet of abrasive paper. Some of the commercial-duty sanders have larger shoes; with these you get two sander-size pieces from each sheet. Sized sandpapers are also available as accessories: These are packaged both in assorted grits and in all-one-type papers, as shown on page 92.

Maintaining the sander

No matter what price tool you buy, it will last longer if you use and maintain it properly. Pad sander maintenance, for the most part, consists of little more than keeping the air ports free of dust accumulation (so the tool won't overheat) and periodic lubrication. The best way to do the former is by blowing out the tool with compressed air. If you lack a compressor, periodically take your sander to the local gas station to blow out all dust. If you do own a compressor, use it on the sander after every work session. Lubricate the tool following the manufacturer's instructions with regard to points, frequency and type of lubricant to use. Today, many sanders are sealed and

require no further lubrication by the owner. But since that's not the case for all sanders, carefully read that section of the manual (which comes with the tool) covering lubrication.

Using the tool

No matter which type of pad sander you buy, it will come equipped with a felt pad on its shoe. The rigidity—or degree of softness—of this pad is intended to suit most of the average jobs a do-it-yourselfer encounters. However, on occasion a softer or harder pad is required.

For example, on some plastics, woods with hard-and-soft grains and for honing of chisels, a more-rigid pad is desirable. In this event, you simply place a piece of 1/8-in. hardboard between the paper and felt pad. To hold it in place, drive three or four brads through the hardboard and into the felt.

If the occasion demands a softer pad, try substituting foam rubber for the felt pad. That's how the dowel in the photo below was sanded (without flattening it).

Some sanders come equipped with an auxiliary handle. On certain jobs, such as for vertical sanding, this can be very handy. A spare handle is often useful on the bench, too, because two-hand operation will assist you in keeping the shoe flat on the workpiece.

No matter which action your sander has—orbital or straight-line—it is usually best to work the tool back and forth parallel with the grain of the wood.

When edge sanding a narrow surface, use both hands to maintain maximum control. If the job is a critical one, clamp boards on both sides of the surface being sanded to prevent any chance of rounding over corners. ★★★

Other jobs for pad sanders



Rockwell's best has 12,000 tiny orbits a minute, conforms to irregular shapes.



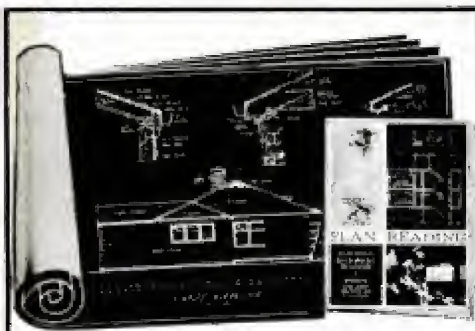
To renew a disfigured felt pad, work it against coarse 60 or 80-grit paper.



Dustless sanding is possible with vacuum attachment as on Black & Decker model.

Sander safety

- Do secure the workpiece with clamps whenever possible.
- Do follow maker's instructions for maintaining and lubricating tool.
- Do use safety glasses for all pad sander operations.
- Do wear proper apparel—no loose clothing or jewelry.
- Don't abuse the line cord; never yank it to remove from receptacle.
- Don't use the tool in the rain or in wet or damp locations.



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SCANNERS

(Continued from page 97)

the number may be 10 MHz, meaning that all crystals you choose within a given band must fall within 10 MHz of each other. (Actual bands are at least twice that wide.) Sometimes the dealer can retune your radio if you choose crystals out of the popular band segments.

Duplex operation. This is needed for services that send and receive on two different channels; if there are such services in your area, and you have a strong interest in hearing them, you'll need two crystals for each duplex service.

Dual conversion. This is an elaborate circuit that eliminates *images*—a type of interference from signals on other channels—in some expensive sets.

Crystal or ceramic filters. Found on higher-priced sets, these improve the set's rejection of adjacent-channel interference caused by signals lying very close to the channels you want to hear.

Digital synthesizers. These are now planned for the marketplace, and use no crystals at all. Instead, individual channel frequencies are tuned with computer-like circuits that let you program your scanner to any desired channels on the band, simply by presetting some switches, or, in a new SBE Linear Systems model, by inserting optically encoded cards into slots.

Other features to look for depend on your application. You may need a.c. and d.c. power cables, for example, so your set can operate from house current or the 12-volt d.c. of your car or boat. In that case, you'd also want a mobile mounting bracket for easy fastening under the dash. If you listen outdoors or at a distance from the receiver, you may need an external speaker jack.

Installation. Since a telescoping antenna is often supplied with a monitor or scanner receiver, there's not much installation for home listening. Much of the time the built-in antenna pulls in sufficiently strong signals for good reception. One trick to improve signals is to slide the antenna to different heights, depending on the band in use; try full length for the VHF low band, 18 inches for the VHF high band and 6 inches for UHF. (These are only approximate dimensions, so experiment on your own). Sometimes you'll improve reception by angling the antenna or moving the receiver to another part of the room. For UHF reception, receiving conditions are more critical and small changes in location, even a

(Please turn to page 140)

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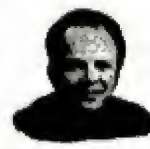


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SCANNERS

(Continued from page 138)

matter of inches, affect signals. Only if you have poor results with a built-in antenna should you try one of the monitor types made for the purpose. Signals travel line-of-sight, so an outdoor antenna placed as high as possible will almost certainly improve reception.

For mobile installation of a scanner hold the mounting bracket under the dash and use it as a template to mark mounting holes. Drill holes for self-tapping screws (after checking clearance above the lip of the dash) and fasten the bracket. Power comes from a nearby fuse block. Your antenna cable can run to a special monitor antenna on the car, or to a *splitter*—an accessory that allows a car's regular AM antenna to feed monitor and regular radios simultaneously.

The legal question. Along with master keys, crowbar, mask and hand tools, a burglar's best friend is often a receiver capable of picking up police calls. In fact, when New York City police arrived at a bank robbery a few years ago they found a monitor, dropped by the fleeing felons, blaring our police calls. Outlawing the sets, however, would hardly curb this activity because receivers could be easily built anyway. There are, however, a few restrictions that anyone buying these sets should know. Most important is a catch-all federal law about "secrecy of communications." It doesn't forbid you from listening, but says you may not *disclose* what you hear to anyone else (a "third party"). Also, the law doesn't want you to profit from anything you hear on the airwaves.

The most important restriction on the local level in some areas says you cannot install a monitor in your car. This is largely to keep nuisance-type thrill-seekers from becoming fire, police and ambulance-chasers and also to prevent criminals from listening in on police operations. It is up to the buyer to determine whether his state or town has such a law. In more than 15 years of following monitor developments, though, I've discovered no law which says you cannot listen to any communications while you're at home.

There are towns that apparently welcome the use of monitors by the public. According to Regency, a leading manufacturer, they include Detroit, Indianapolis and Dallas. Seems that police there enjoy some image-boosting when people listen to their exploits over the radio! ★★★

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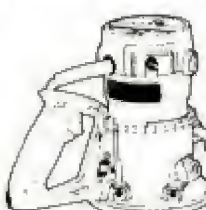
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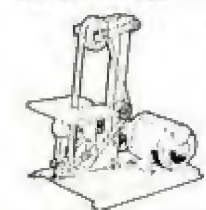


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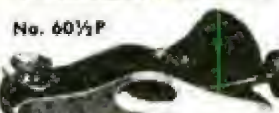
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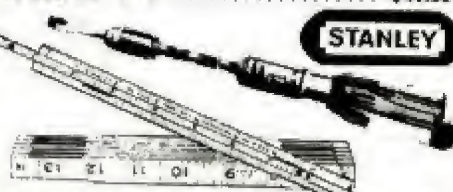
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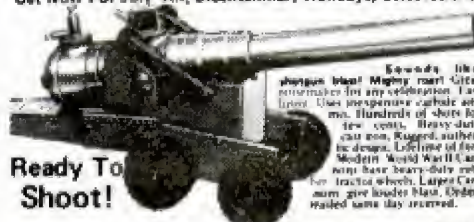
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(Continued from preceding page)

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(Continued on next page)

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(Continued from preceding page)

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157 (Continued on next page)

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